Chapter 3

Monarch on kobold spike gayfeather
John Mosesso, Jr./NBII

Affected Environment

- Physical Environment
- Biological Environment
- History and Cultural Resources
- Socioeconomic Environment
- Refuge Complex Administration

Physical Environment

Water Quality

All of the refuges but Sayville are associated with some source of water. The three major water bodies that fall under the jurisdiction of the Complex are the Carmans River, Oyster Bay, and the Great South Bay. The Carmans River is the largest undeveloped estuary system remaining on Long Island, and contains habitat vital for shellfish, migratory finfish and waterfowl. A local favorite for fishing and paddling, this 11-mile-long river flows into Bellport Bay in the eastern portion of Great South Bay. Wertheim refuge protects a 3.4-mile stretch of the Carmans River estuary by preserving and protecting its surrounding wetlands that filter pollution. The State of New York has designated that lower section a Wild and Scenic River. Yaphank Creek, also at Wertheim refuge, still has native salters (trout) because of the excellent water quality.

The Suffolk County Department of Health Services and the Suffolk County Community Oversight Committee assessed the river and reported that it has good water quality on the whole (Citizens Campaign for the Environment 2003). Their assessment includes their analysis of stream sediment and surface water samples. Tests were completed for volatile organic chemicals, gross alpha and gross beta indicators of radionuclide contamination, pesticides and heavy metals. Visit *http://www.epa.gov/radiation/radionuclides/* for more information on radionuclide contamination.

However, areas of concern include nitrogen and coliform in the water column and organic compounds in groundwater. Water quality data collected by the SCDHS at the USGS gauging station on the Carmans River at Yaphank indicates total nitrogen concentrations in the range of 1–2 ppm, which is higher than those observed for the Peconic River (Spinello et al. 1993). The mouth of the river is presently closed to shellfishing because of high coliform counts. Inputs from road runoff and waterfowl, including excessive numbers of mute swans, tend to be leading sources of coliform bacteria. Traces of 1,1,1–trichloroethane and other dry-cleaning solvents have also been detected in ground water plumes that feed the Carmans River and its eastern tributaries (SCDHS date unavailable). Thus, despite its protected status, the river represents a significant source of nitrogen and possibly other contaminants in the poorly flushed Bellport Bay (Central Pine Barrens Joint Planning and Policy commission 1996).

The proximity of suburban development increasingly threatens the Carmans River watershed with non-point source pollution, which could lead to degraded fisheries and continue the closure of local shellfish beds. Polluted storm water runoff is the most widespread water quality problem along the southern shore of Long Island (National Oceanic and Atmospheric Administration 2005).

The quality of life in the coastal communities of Oyster Bay and Cold Spring Harbor depends on the health of the bodies of water around them. With that in mind, Friends of the Bay has developed a volunteer water quality monitoring program, in cooperation with the Service, U.S. Environmental Protection Agency, New York State Department of Environmental Conservation, and local governments and volunteer monitoring groups around Long Island Sound. Each week, trained volunteers and environmental scientists monitor various components of the marine ecosystem. The parameters they track include water temperature, clarity, salinity, dissolved oxygen and, most recently, coliform bacteria.

Although no single test can accurately predict the health of this complex ecosystem, dissolved oxygen is a good indicator of overall water quality. The monitoring by Friends of the Bay indicates that Oyster Bay and Cold Spring Harbor generally are healthy. However, monitoring at all of the sites failed to meet the New York State dissolved oxygen standard at least once in 1999, and Mill Neck Creek, an Oyster Bay tributary, is closed year-round to shell fishing. Visit the Friends of the Bay Web page at *http://www.friendsofthebay.org/programs/waterquality.asp*.

Topography, Geology and Soils

Long Island can be categorized as generally flat, low-elevation terrain. Elevation ranges from sea level to 60 ft. above sea level; the highest points are located on the moraines along east-west axes on the north shore and the mid-section of Long Island. The topography south of the moraines is flat, with a south-facing aspect. The topography north of the moraines is generally flat or rolling, with a north-facing aspect. Slopes are gradual at most Long Island sites, with the exception of the coastal headland habitats that have extreme slopes. Those provide an abrupt edge between terrestrial vegetation, eroded terrestrial bluffs, and strand habitats. The Target Rock, Oyster Bay, and Morton refuges have headland habitats.

The soils of Long Island are less than 12,000 years old, and reflect their glacial parent materials. The soils north of the moraines, i.e., those of Conscience Point, Oyster Bay, Morton, and Target Rock, are medium to coarse textured and moderately well drained. Moraine topography tends to be rolling. An outwash plain south of the moraine, where Lido Beach, Seatuck, Sayville, Wertheim, and Amagansett are located, is coarse textured, excessively drained, infertile, and flat. Sandy loams predominate, but soils range from loams to sands.

Air Quality

Air quality is important, not only for our health, but also for the health of fish and wildlife species and their habitats. The air pollution emitted by power plants, factories, paper mills, vehicles, fires, and

other sources can harm those natural resources. Air pollutants can have serious effects on animals, plants, lakes, streams, soils, and visibility across the many acres managed by the Service. Pursuant to the Clean Air Act, as amended in 1977, the Service has an affirmative responsibility to protect air-quality-related values on national wildlife refuges, with special emphasis on Class 1 Wilderness Areas. Those are areas in excess of 5,000 acres that were formally designated as Wilderness before August 1977. However, no Class I areas lie near any portion of refuge lands or waters on Long Island.

The type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions determine air quality at any location in the atmosphere. The EPA designates an area as being in "attainment" for a pollutant if ambient concentrations of that pollutant are below the National Ambient Air Quality Standards (cf. 40 CFR 50), and "nonattainment" if violations of the NAAQS occur. In areas where insufficient data are available to determine attainment status, designations are listed as unclassified. Unclassified areas are treated as attainment areas for regulatory purposes.

Air quality management in the New Jersey-New York-Connecticut Interstate Air Quality Control Region, which includes Nassau and Suffolk Counties and the entire Complex, is in attainment with NAAQS for five of the six criteria pollutants: sulfur dioxide, nitrogen oxides, particulate matter, lead, and carbon monoxide (NYSDEC 2001). The counties only exceeded the NAAQS for the sixth criteria pollutant, ozone, referenced in 40 CFR 81. Ozone most likely is high as a result of the ultraviolet oxidation of hydrocarbons produced by vehicles.

The nearest significant source of hazardous or criteria pollutants is the New York City area, located approximately 60 miles west of Complex headquarters. Based on the data collected and referenced in 40 CFR 81.333, the area falls within applicable Federal and State ambient air quality standards, with the exception of ozone.

Climate and Weather

The Atlantic Ocean greatly modifies the climate of Long Island, which is categorized as humid continental. Continental influences dominate the climate, and the proximity of the ocean produces a significant maritime influence. Those climatic characteristics result in an extended period of freeze-free temperatures, a reduced range in both diurnal and annual temperature, and heavy precipitation in winter relative to that of summer as compared to other areas in southern New York.

Temperatures are hottest in July and August and coldest in January and February. Daily high temperatures above 90°F occur on average

10 days a summer, and the growing season runs between 200 and 210 days, or from March through September. A temperature at 0°F or lower is recorded one or two days annually. The snow season lasts from late December through early March; snowfall averages 26 inches annually. Precipitation is reduced in June, July, and September; months of high precipitation include March, August, November, and December. Yearly rainfall averages 43.4 inches. Relative humidity varies daily: it ranges from a minimum of 20 percent to a high of 100 percent, with a mean of 60 percent during the 1300 hour period.

A sea breeze is a common local occurrence on most of the coastal refuges. Although winds blow from all directions, winds with a westerly component are most common. Wind speeds tend to be higher in winter and spring than in summer and autumn. The hurricane and tropical storm season extends from August through early October.

Ecological Processes

Historically and ecologically, fire has played the dominant role in shaping the pattern of Long Island's terrestrial vegetation, and it continues to be the major factor influencing that vegetation (Olsvig et al. 1979). Fire is also a necessary ecological process in maintaining Long Island's vegetative communities. Ecologically, the main processes influencing that terrestrial vegetation are wildfire and its suppression, with soil substrate determining the types of plants that may become established in a given area. A second set of processes that also impact terrestrial vegetative patterns are major storms, forest pests like gypsy moths, and large population densities of white-tailed deer that preclude forest regeneration on a local scale by overbrowsing.

The frequency and severity of fires, which are still common on Long Island, largely determined the pattern of vegetation on the landscape. The warm season grasslands of the Hempstead Plains, oak-brush plains, and dwarf pine plains had the most frequent fires, with return intervals of about 8 years. Fires also occurred with great frequency but not to the same extent in pitch pine, pine-oak, and oak-pine stands, with return intervals ranging from 16 to 26 years. Fires were common in the pine barren vegetation along the south shore, although less common in the forest types north of the moraines on Long Island's north shore. Historically, most of the fires were believed to have resulted from Native American activities in managing land and hunting.

The second major factor influencing the vegetative pattern is soil characteristics: particularly, the amount and type of sand. The most fire-dependent vegetation dominates areas with higher concentrations of sand; the least fire-dependent vegetation dominates areas with less sand. In the colonial period, portions of Long Island were cleared for farming and other agriculture. However, the central pine

barren area was not cleared, because of its sandy soils. Native Americans continued their traditional use of fire, and colonists also used fire to clear land. Development since colonial times on Long Island focused on clearing wildlands for agriculture and housing. Fire as a management tool became less common with increasing suburbanization, although wildfires continued to be a conspicuous process in pine barren habitats at Long Island.

Prescribed fires mimic the historic fires that shaped the terrestrial vegetation of Long Island.
R. Parris/USFWS

Many communities on Long Island now suppress wildfires. However, we and other organizations recognize the ecological value of wildfires via prescribed burns. The New York State Forest Rangers apply that technique to state wildlife management lands. The Pine Barrens Commission, a recent multi-agency initiative formed to manage the pine barrens, is now coordinating wildfire suppression efforts and developing a prescribed fire program. The Nature Conservancy keeps a fire boss on Long Island and they have assisted the refuge with prescribed burns on several occasions.

Wertheim is one of the first locales on Long Island to have initiated a prescribed burning program. We maintain two to five qualified burn staff, two trucks outfitted with fire pumps, and a cache of hand tools and associated fire fighting equipment. Although we do not currently maintain a qualified Burn Boss on staff, our Zone Fire Management Officer in northern New Jersey fills that operational function. We completed our Fire Management Plan in 2001. Depending on other priorities, we participate in the Central Pine Barrens Wildfire Task Force and Prescribed Fire Subcommittee. That has allowed us to collaborate with other land management agencies in the use of prescribed fire and interact with the myriad local fire departments on Long Island responsible for wildfire suppression. Since 2000, we have burned approximately 40 acres of woodland, 11 acres of grassland, and 35 acres of *Phragmites* marsh with prescribed fire. With the exception of a 7-acre grassland burn at Conscience Point and a 2-acre grassland burn at Sayville, all the remaining burns occurred at Wertheim. In addition to burns at refuges, we have participated in a roughly equal number of burns on state, Suffolk County, and TNC properties.

Biological Environment

Long Island's vegetation has been categorized into a variety of schemes. According to Bailey (1995), all of the refuges comprising the Complex are located in the eastern broadleaf forest province. Barbour and Billings (1988) place Long Island in their ecological coastal grouping, which includes the northernmost portion of the southeastern coastal plain. The authors specifically refer to the vegetation of Long Island as the "Northern Pine Barrens." On a more local scale, Olsvig et al. (1979) and Villani (1997) have provided a classification scheme of Long Island's terrestrial vegetation types focusing on pine barren types. The Service has placed the refuges of the Complex in two delineated ecosystems: the Hudson River/New York Bight Ecosystem and the Connecticut River/Long Island Sound Ecosystem. The habitat types described below are found on the Complex. Please refer to the vegetation cover maps for each refuge on the following pages and table 3.1 for details.

Habitat Types

The following sections describe some of the major terrestrial, wetland, and aquatic habitats associated with the Complex. See table 3.1 for gross cover types of the Complex.

Terrestrial Habitats (based on Reschke 1990)

Conifer plantations can be found at Wertheim and Seatuck refuges. Eastern white pine and Norway spruce dominate. Woody understories and field layers are sparse.

Grasslands are present at six of the nine refuges, and include both warm and cool season species. Warm season grasslands are considered the native grasslands of Long Island, and are dominated by little bluestem, switch grass, Indian grass, broomsedge, and big bluestem. The federal-listed endangered plant sandplain gerardia is associated with certain warm season grasslands. Warm season grasslands are fire-adapted, and occur on refuges in both forest openings and on grasslands greater than 10 acres. Most of the refuges with grasslands contain cool season species, including such non-native grasses as meadow grass, orchard grass, timothy, fescue, and crab grass. Two native cool season grasses that occur in refuges are beach grass, which occurs on primary and secondary dunes, and sweet vernal grass, which occurs on forest edges and as a component of forest meadows.

Improved grounds occur at Wertheim, Seatuck, Morton, and Target Rock, which have public use facilities or structures. Improved grounds tend to lie adjacent to roadways, buildings and parking lots. The grounds are dominated by cool season grasses, principally bluegrass, crab grass, and fescue species. Improved grounds also possess some shade trees and ornamental shrubs. We mow those grounds about every two weeks in the growing season.

Maritime oak forests have a composition similar to oak/beech forests. This type was described by the New York Natural Heritage Program, using the forest stands of Morton as the type example. The stands are located on a narrow peninsula surrounded by bays. The principal difference between this forest type and the preceding type is the greater humidity and wind effects associated with the maritime oak forest.

Mixed-oak forests, the most common forest type on the Complex by acreage, occur only on the southern outwash plain of Long Island, where Wertheim and Seatuck are located. The dominant overstory vegetation includes white oak, red oak, black oak, scarlet oak, and pignut hickory. Pitch pine may be present, but generally consists of less than 10 percent of the overstory. The woody understory is robust, ranges in height from 1 foot to 6 feet, and is dominated by black huckleberry, lowbush blueberry, briar, and highbush blueberry. The field layer is sparse, and the litter layer is robust. In areas of past gypsy moth infestations, where oak mortality has occurred, the stands are open-canopied and the understory is fuller and more robust.

Oak/beech forests grow at Target Rock, Oyster Bay, and Conscience Point. That type is similar to mixed oak, except it grows on sites north of the moraine where the soil consists of less sand, is more fertile, and has increased water-holding capacity. Tree growth and stand quality are more robust than in the mixed-oak stands. Common overstory trees in this type include red oak, black oak, white oak, American beech, and tulip tree. The woody understory varies from sparse to robust, and includes mountain laurel, maple-leaved viburnum, lowbush blueberry, briar, and black huckleberry. Field layers tend to be sparse.

Oak/pitch pine forests grow at both Wertheim and Seatuck. The overstory vegetation is similar to the mixed oak type, except that the pitch pine component composes between 10 percent and 70 percent of the overstory. The woody understory, field layer, and leaf litter layer are similar to the mixed oak type. The oak-pitch pine type, like the mixed oak type, occurs as both closed canopied and open canopied stands due to past oak mortality by gypsy moth.

Pioneer hardwood forests are typically the first woody vegetation in succession at many of the refuges. Dominant overstory vegetation includes black cherry, sassafras, and black locust. Woody understories are robust and include raspberry/dewberry, briar, black huckleberry, and lowbush blueberry.

Pitch pine forests grow at Wertheim and Sayville, where pitch pine makes up 70 percent of the tree species. Other overstory species include white oak, red oak, and black oak. Woody understory species

include black huckleberry, lowbush blueberry, and briar. In a closed canopy stand, the woody understory is sparse, but in an open canopy stand, it is robust. Fuels include the robust leaf litter and the woody understory. Open canopied pitch pine stands present a fire danger because of their high fuel loading and fuel ladders.

Red cedar forests are dominated by red cedar, with few other species in the overstory. This category only includes red cedar past the sapling stage when the canopy is starting to close. The woody understory and field layers are sparse.

Red maple/tupelo forests are dominated by an overstory of red maple and tupelo. A robust woody understory consists of spicebush, arrowwood, and sweet pepperbush. This forest type frequently has a prevalent field layer, frequently including tussock sedge. This forest type grows on moist sites, particularly along stream corridors, although some stands grow at more mesic sites.

Unvegetated spoil consists of dredged aquatic sediment placed on either a wetland or terrestrial site. Those materials generally result from the dredging of boat channels. The substrate consists of large particles of sand. Due to the substrate's poor ability to hold nutrients and moisture, vegetation is generally lacking, with the exception of sporadic patches of low-growing false heather. This cover type occurs at Seatuck.

Upland shrub habitats can be found at most of the refuges, and are dominated by arrowwood, Asiatic bittersweet, honeysuckle, scrub oak, dogwood, and other woody species. Upland shrub areas grow along wetland boundaries, forest edges, on impoverished soils, and in areas where high densities of white-tailed deer cause a lack of forest regeneration. Shrub heights in these habitats range from 4 feet to 12 feet.

Dredge site at Seatuck
Suffolk County Vector Control

Table 3.1. Gross Cover Types of the Complex

Habitat Types	Percent of Total	Total Acres	Acres Within Each Refuge								
			Amagansett	Conscience Point	Lido Beach	Morton	Oyster Bay	Sayville	Seatuck	Target Rock	Wertheim
Unvegetated Habitats; 3496.4 acres (55.1% of land base)											
Open Water	53.7	3405.6		0.2		3.7	2947.7		4.0		450.0
Strand	1.3	85.5	5.5	0.1		37.4	31.0		1.0	7.7	2.8
Unvegetated Spoil	5.3	0.1							5.3		
Herbaceous Habitats; 1200.9 acres (18.8% of land base)											
Grassland	2.3	144.9	26.7	26.0		22.4			30.0	1.3	38.5
Improved Grounds	0.1	9.2				1.9			2.0	1.5	3.8
High Marsh	7.1	452.1		6.0	12.0	5.5	65.0		54.0	0.4	309.2
Intertidal Marsh	3.8	244.0		6.0	7.0	15.0	162.0		12.0	1.0	41.0
Robust Emergent Marsh	5.5	350.7	0.2				0.3		16.0		334.2
Shrub Dominated Habitats; 120.1 acres (1.9% of land base)											
Upland Shrub	1.2	78.1	3.6	2	3.0	28.0		3.0	12.3	3.1	26.1
Shrub Swamp	0.7	42.0					1.0				38.0
Forest Dominated Habitats; 1524.5 acres (24.2% of land base)											
Conifer Plantations	0.1	6.0								5.0	1.0
Maritime Oak	0.6	39.3				39.3					
Mixed Oak	11.5	730.3							35.0		695.3
Oak/Beech	1.2	77.5		15.7			2.0			59.8	
Oak/Pitch Pine	3.3	207.2							4.0		203.2
Pioneer Hardwood	1.1	71.8		4.0		18.7			12.4		36.7
Pitch Pine	2.9	186.8						18.0			168.8
Red Cedar	0.4	24.1				7.5				0.2	16.4
Red Maple/ Tupelo	2.9	181.5				7.5			9.0		165.0

Wetland Habitats

High marshes occur at all refuges except Sayville and Amagansett. High marsh is dominated by salt hay, short-growth-form cordgrass, salt grass, black grass, and salt marsh bulrush. High marsh lies between the intertidal marsh and terrestrial lands. High marsh is flooded by high rainfall, spring tides, or above-normal high tides.

Intertidal marshes likewise are found at all refuges except Sayville and Amagansett. The tide floods the intertidal marsh daily, and the tall-growth form of smooth cordgrass dominates the vegetation.

Robust emergent marshes occur at Wertheim, Amagansett, Oyster Bay, and Seatuck. The vegetation is dominated by invasive *Phragmites*, cattails, brackish cordgrass, or bulrush, at heights ranging from 3 feet to 12 feet.

Shrub swamps can be found at Wertheim and Target Rock. Arrow-wood, swamp loosestrife, willow, and alder dominate. Shrub swamps typically lie on the edges of marshes and streams. Fuels include leaf litter, herbaceous material, and the woody overstory. Shrub height ranges from 3 feet to 10 feet.

Aquatic Habitats

The Complex has both tidal and nontidal surface waters. Nontidal waters include ponds, streams, and swamps. Tidal waters include bays, ponds, salt marshes, brackish marshes, freshwater marshes and streams. The tide floods most of the intertidal wetlands daily; the greatest inundation occurs at the new and full moons. The tide also floods the high salt marshes periodically, but at longer intervals than the intertidal marshes. Salt marshes are most prominent at Wertheim, Seatuck, and Lido Beach; subtidal habitats dominate Oyster Bay.

Open water habitats consist of subtidal, tidal, and nontidal waters. The bulk of subtidal and tidal waters occurs at Oyster Bay and Wertheim. That acreage also includes freshwater and brackish ponds at Morton, Conscience Point, Seatuck, and Target Rock. Common vegetative species in those open water areas include eel grass, green fleece, sea lettuce, and waterweed.

Tidal wetland
© T. Kman

Strand or beach habitat occurs at all refuges except Sayville and Lido Beach. This habitat borders tidal waters, and typically consists of coarse, sediment-like sand or small stones. Strand habitat extends from the water's edge to upland vegetation, typically beach grass, on the primary dune. Vegetation both alive and dead is generally lacking in strand habitats.

Fish and Wildlife

The refuges of the Complex provide significant, even critical amounts of habitat for the majority of wildlife species known to occur on Long Island. Nearly 500 vertebrate species and approximately 500 species of vascular plants have been documented at the Complex. Many invertebrate species also live on the Complex, including several species of commercial shellfish. The nine refuges are widely spread, and encompass most of the vegetation types on Long Island, which in-turn provide habitat for a variety of wildlife ranging from forest interior nesting Neotropical migrant birds to marine mammals. The coastal location of the refuges also makes them part of a major migration corridor for a variety of birds, including waterfowl, waterbirds, raptors, and songbirds. Appendix A lists birds, mammals, reptiles, amphibians, fish, and butterflies that can be found at the Complex.

Birds

Avian species make up the largest single class of vertebrates at the Complex. Close to 300 species have been documented on its refuges. Approximately 70 percent of the waterfowl wintering in New York State spend the months of October through April on Long Island. Up to 25,000 waterfowl have been documented on the waters and wetlands of the Complex. Waterbird use also is common, with peak periods for long-legged wading birds, terns, shorebirds and other waterbirds in the warmer months. The coastal location of the refuges also makes them important migratory habitat for many raptor species, particularly the state-listed endangered peregrine falcon and the state-listed threatened northern harrier. Other raptor species include osprey, hawks, and owls.

Foxes keep populations of rodents and rabbits under control and may disperse seeds.
John Mosesso, Jr./NBII

Songbirds are conspicuous on the refuges, and a major attraction for many of our visitors. That songbird community is diverse, and includes many Neotropical migrants.

Mammals

Thirty-three species of mammals have been documented at the refuges. White-tailed deer, eastern cottontail, gray squirrel, red fox, eastern chipmunk, muskrat, and harbor seal attract visitors. Bats compose about a quarter of the mammalian species at the Complex.

Northern water snake
John Mosesso, Jr./NBII

Reptiles

Thirty-five species of reptiles and amphibians inhabit the Complex. Eastern box turtles and eastern hognose snakes are of particular interest because of their perceived current decline on Long Island, where both species were once considered abundant and dominant. Eastern box turtles are also a species in which our visiting has expressed tremendous interest. The eastern mud turtle, a state-designated endangered species, occupies aquatic habitats at Wertheim.

Amphibians

The dominant amphibians at the Complex include red backed salamander, bullfrog, green frog, wood frog, Fowlers toad and spring peeper. Additional work is needed to survey the salamander community at the Complex, particularly mole salamander species.

Fish

The Complex encompasses diverse aquatic habitats ranging from marine to freshwater and tidal to non-tidal, as well as lentic and lotic habitats. The fish community reflects that diversity. Salt marshes support an interesting array of killifish species. Bays provide seasonal habitat for many recreationally and commercially important marine species. Tidal rivers and streams support both catadromous and anadromous species. Freshwater streams provide trout habitat, and ponds and impoundments support warm water fisheries. More than 100 species of fish inhabit the waters of the Complex.

Invertebrates

Numerous invertebrate species also inhabit the Complex. Although it lacks an exhaustive inventory of the invertebrate communities found at its refuges, appendix B lists butterfly species. Standard works like Boyd (1991), Boyd and Marucci (1979), and Dindal (1979) provide information on invertebrates likely to occur in refuge habitats, particularly in pine barrens and tidal wetlands. Shellfish are found on many of the refuges. Those of particular commercial and recreational interest include oysters, hardshell clams, scallops and blue claw crabs. The waters associated with Oyster Bay are estimated to produce approximately 90 percent of the oysters harvested in New York.

Rare, Threatened or Endangered Species

Federally designated endangered or threatened species at the Complex include the sandplain gerardia, piping plover, roseate tern, bald eagle, and Kemp's ridley, loggerhead, hawksbill, green, and leatherback sea turtles (USFWS 1995). State-listed endangered or threatened animal species at the Complex–not already federal-listed–include the golden eagle, peregrine falcon, black rail and king rail, black, common, and least tern; and short-eared owl, loggerhead shrike, pied-billed grebe, least bittern, northern harrier, upland sandpiper, sedge wren, eastern mud turtle, tiger salamander, northern cricket frog, Hessel's hairstreak, and frosted elfin (USFWS 1995, NYSDEC 2003).

State-listed endangered or threatened plant species at the Complex–not already federal-listed–include little-leaf tick trefoil, round-leaf boneset, coast flatsedge, bushy rockrose, velvety lespedeza, opelousa smartweed, small-flowered pearlwort, seabeach knotweed, swamp cottonwood, rough rush grass, marsh straw sedge, stargrass, slender pinweed, flax-leaf white-top, stiff tick-trefoil, northern blazing star, sandplain wild flax, southern yellow flax, few-flowered nutrush, spring ladies-tresses, swamp sunflower, water pigmy weed, and silver aster.

The state- and federal-listed endangered shortnose sturgeon has been documented in the lower portion of the Hudson River, but no sightings at the refuges of the Complex have been reported.

State threatened plant communities, neither of which are protected, include maritime grasslands and red maple-black gum swamps.

See the table at the end of appendix A for threatened, endangered and species of special concern at the Complex.

Habitat requirements

Sandplain gerardia is part of a fire-dependent grassland community.

Bald eagles principally use the refuges while migrating or wintering, and are associated with aquatic or wetland habitats and their adjacent terrestrial borders. Peregrine falcons also use the refuges while migrating, and forage on the rich waterfowl resource. Short-eared owls require broad expanses of open land with low vegetation, such as grasslands or low-structured open shrub lands, for hunting and nesting (Holt and Leasure 1993). Northern harriers make use of emergent wetlands and grasslands.

The piping plover and roseate tern are associated with intertidal or strand habitats. Common terns nest on sandy beaches, gravelly or sparsely vegetated shores, and both fresh water and salt water high marshes (Burger and Gochfeld 1991, Clapp et al 1983). Least terns

prefer areas clear of vegetation. They nest in loose colonies on coastal dunes and on sand or shell beaches just above the high tide line, or along major interior rivers (Hunter 1975, Blodget 1978, Carreker 1985, Thompson et al. 1997).

Black rails are found in high coastal marshes and wet meadows. King rails are found in a variety of freshwater marshes and marsh-shrub swamp habitats. Black terns feed and nest in large, shallow, freshwater emergent wetlands, the margins of lakes, some river edges, and semi-permanent ponds (Dunn and Agro 1995). Pied-billed grebes use "ponds, sloughs and marshes…and occasionally estuarine wetlands" (Gibbs and Melvin 1992); preferring human- and beaver-altered wetlands more than those of glacial origin (Gibbs et al. 1991). Least bitterns use freshwater and brackish marshes with dense, tall growths of aquatic or semi-aquatic vegetation interspersed with clumps of woody vegetation and open water, and occasionally use salt marshes.

Loggerhead shrikes require open country with short vegetation, including riparian areas and open woodlands. Upland sandpipers use large open grasslands, and prefer to nest, feed, and court in short vegetation (Ailes 1976, Kirsch and Higgins 1976), interspersed with taller, concealing grasses (Johnsgard 1981, White 1988, Carter 1992). Sedge wrens use densely vegetated sedge meadows, wet hayfields, the upland margins of ponds and marshes, and coastal brackish marshes (Gibbs and Melvin 1992).

Sea turtles depend on subtidal habitats. Eastern mud turtles hibernate in emergent wetlands and mature pitch pine and oak-pitch pine stands, and nest in warm season grasslands. Adult tiger salamanders inhabit forests, grasslands, or marshy areas (Petranka 1998). Northern cricket frogs use the edges of ponds and streams with submerged or emergent vegetation (Stebbins 1966).

Federal- and state-threatened loggerhead sea turtles depend on subtital habitats.
USFWS

The two lepidopteran species require their host plants to survive. Hessel's hairstreak requires Atlantic white cedar, which grows in swamps and stream banks (Vaughn and Shepherd 2005). The frosted elfin requires wild lupines, and prefers edge habitats near oak savannah and pine barrens with a fairly dense canopy (Packer 1999).

Amagansett National Wildlife Refuge

The current management of Amagansett includes providing habitat for federally listed threatened species such as piping plover; protecting native strand communities, including beach, primary and secondary dunes, and swales; and, emphasizing migratory birds and threatened or endangered species. Other management activities include controlling invasive species such as Japanese black pine and developing nesting structures for raptors. See map 3-1 on page 3-19.

Terrestrial Habitats

Amagansett comprises Atlantic coastal barrier beach, primary dune habitats, a secondary dune/swale complex, and scrub oak vegetation. It has a unique double dune system, and is one of the few coastal beaches remaining undeveloped on Long Island. The refuge beach is a typical straight beach formed against gradually rising uplands. The primary dune line averages 10 to 15 feet in height, and is largely intact. Beach grass dominates on these dunes. Species present on the secondary dunes include beach grass and extensive areas of false heather. Behind the foredunes lie areas of poison ivy, beach plum, bayberry, and wild rose. Those areas grade into some small bogs that support cranberry, sedges, and various grasses. The inland portion of the refuge consists of scrub oak, bayberry, beach plum, wild rose, green briar, and red cedar. Approximately 100 acres of The Nature Conservancy holdings border the refuge to the west. East of the refuge lie well-developed private and public bathing beaches.

In the spring and summer, the secondary dunes and the swale complex of the refuge display an impressive array of wildflowers, grasses, and orchids (see table 3.2).

Wetland Habitats

Two palustrine emergent wetlands of approximately 1 acre each lie in the dune/swale terrain. Those contain permanently standing shallow water. The dominant emergents there are common threesquare and rush. Common reed is scattered throughout those wetlands, and cranberry is sometimes found near their shallow fringes (Norton et al. 1984).

Fish and Wildlife

Birds

The coastal location of the refuge enhances its value to birds during migration, although its small size and uniform habitat limits the diversity of bird species to 26. Ipswich sparrows, a race of the Savannah sparrow, are known to winter there. It serves piping plovers and many terns as a foraging area, and piping plovers nest immediately west of it.

Table 3.2. Vegetation Observed at Amagansett

beach pea	*(Lathyrus maritimus/japonicus)*
blue-eyed grass	*(Sisyrinchium montanum)*
butter and eggs	*(Linaria vulgaris)*
calopogon	(*Calopogon sp.*)
cinquefoil	*(Potentilla sp.)*
common evening primrose	*(Oenothera biennis)*
common highbush blueberry	*(Vaccinium corymbosum)*
deptford pink	*(Dianthus deltoides)*
false heather	*(Hudsonia tomentosa)*
goldenrod	*(Solidago sp.)*
grass pink orchid	*(Calopogon pulchellus)*
horseweed	*(Erigeron canadensis)*
hyssop-leaved thoroughwort	*(Eupatorium rotundifolium)*
indian grass	*(Sorghastrum nutans)*
large cranberry	*(Vaccinium. macrocarpon)*
marsh straw sedge	*(Carex hormathodes)*
mountain sandwort	*(Arenaria groenlandica)*
ox-eye daisy	*(Chrysanthemum leucanthemum)*
path rush	*(Juncus tenuis)*
peppergrass	(*Lepidium sp.*)
poor-man's pepper	*(Lepidium virginicum)*
red fescue	*(Festuca rubra)*
rose	*(Rosa sp.)*
rose pogonia	(*Pogonia ophioglossoides*)
round-leaved thoroughwort	*(Eupatorium hyssopifolium)*
sickle-leaved golden aster	*(Chrysopsis falcata)*
silver rod	*(Solidago bicolor)*
slender fragrant goldenrod	*(Solidago tenuifolia)*
snake mouth orchid	*(Pogonia ophioglossoides)*
tall wormwood	*(Artemisia caudata)*
toadflax	*(Linaria vulgaris)*
wild carrot	*(Daucus carota)*
wild indigo	*(Baptisia tinctoria)*
wood/common strawberry	*(Fragaria vesca)*

Raptors

The refuge serves an important function for raptors that migrate along the coast. American kestrels, merlins, peregrine falcons, sharp-shinned hawks, and Cooper's hawks have been documented at Amagansett during migration. Up to 100 American kestrels in one hour have been observed at the peak of their autumn passage. Snowy owls and rough-legged hawks have also been documented in the winter.

Waterfowl

The use of the refuge by waterfowl is limited to adjacent offshore areas. In the winter months, the most common waterfowl species observed include white-winged scoter, surf scoter, oldsquaw, and red-breasted merganser.

Shorebirds, Gulls, Terns and Allied Species

The marine beach and swales provide habitats for a variety of sandpipers, plovers, gulls, and terns. Black-bellied plovers and sanderlings are the shorebirds most commonly using the beach. Herring gull, great black-backed gull, and ring-billed gull are common year-round at Amagansett, and northern gannets can be frequently observed from the refuge beach in winter.

Reptiles and Amphibians

Complex staff have observed several eastern hognose snakes at Amagansett. The snake, once an abundant secondary dune species on Long Island beaches, has been steadily declining in numbers. Eastern spadefoot toads also use the refuge.

Rare, Threatened or Endangered Species

The federal-listed endangered roseate tern uses the beach at Amagansett as a resting area, and forages in its offshore waters. Like the roseate tern, the state-listed endangered least tern also uses the beach as a resting area. Piping plovers, a federal-listed threatened species, have also been observed annually foraging and loafing there, and have recently nested on the refuge. New York's Natural Heritage program lists records of the state-listed endangered round-leaf boneset and threatened little-leaf tick-trefoil at Amagansett.

Piping plovers are a federal-listed threatened and state-listed endangered species.
Richard Kuzminski

U.S. Fish & Wildlife Service

Map 3-1

Amagansett National Wildlife Refuge

Suffolk County, New York

Vegetation Cover Map

Produced by Long Island NWR, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

1:4,061

0 0.1 0.2 Miles

0 0.1 0.2 0.3 Kilometers

Conscience Point National Wildlife Refuge

Conscience Point consists of 60 acres of salt marsh, deciduous forest, shrub habitats, kettle holes, and grassland. About one-third of the refuge is wetland, primarily salt marsh; the other two-thirds are upland habitats (see map 3-2 on page 3-23).

Terrestrial Habitats

The refuge preserves and maintains one of the best examples of maritime grassland remaining on Long Island. The grassland is dominated by little bluestem, with lesser amounts of Indian grass, poverty grass, and prickly pear cactus. The tidal wetlands provide habitat important for black ducks and a host of other waterbirds. Management activities are geared toward maintaining native grassland, controlling invasive species, and protecting habitat.

Maritime grasslands are a globally rare plant community found on outwash plains near oceans or bays. Fewer than 100 maritime grasslands are found worldwide (Reschke 1990). Since 1989, the State-listed coast flatsedge and bushy rockrose have been recorded at the refuge. Historically, several other listed plants associated with maritime grasslands were known there. The rarity of the maritime grassland habitat type on Long Island is due partly to the rapidity which the vegetation succeeds into maritime shrubland and the absence of disturbance, e.g. fire, to reduce the spread of woody vegetation.

Wetlands Habitats

Conscience Point is part of a unique wetland network: the Sebonac Creek/West Neck/Scallop Pond System or, in local vernacular, the Cow Neck Complex. That system encompasses about 300 acres of open water, salt marsh, irregularly exposed tidal flats, and aquatic beds (Norton et al. 1984). The Cow Neck Complex includes large, privately owned wetlands and wetlands owned by The Nature Conservancy.

The extensive salt and brackish tidal marshes include a number of tidal creeks, ponds and coves. The marshes characteristically comprise low and high marsh areas dominated by smooth cordgrass and saltmeadow cordgrass, respectively, with various admixtures of glasswort, spikegrass, black grass, and sea lavender, among others. Their upland shrubby edges often are dominated by groundselbush, marsh elder and bayberry, grading into upland forest of red maple and white oak.

Fish and Wildlife

More than 150 species of birds and 20 species of mammals have been documented at Conscience Point. The refuge supports only a limited number of breeding bird species, largely due to its small size and minimal forest cover, but bird usage is high among grassland, shrub, forest edge, and salt marsh-dependent species. The refuge salt marsh provides a habitat for a variety of water birds, and provides winter habitat important for black ducks.

Birds

Bobwhite quail and ring-necked pheasants are also observed on Conscience Point, which has one of the highest densities of quail in the Complex.

Raptors

Osprey and several hawk and owl species also have been observed at Conscience Point.

Waterfowl

The Cow Neck Complex is known for its high concentration of black ducks. Waterfowl numbers are highest in the colder months, and decline in the warmer months. Black ducks are by far the predominant waterfowl species using the refuge. The area is considered to be regionally significant for black ducks, both as breeding and wintering habitat; wintering black duck densities there are among the highest for Long Island. Because of those factors, the Peconic Estuary Program has tentatively identified the Cow Neck Complex as significant habitat for black duck. Other common waterfowl species include bufflehead, Canada goose, red-breasted merganser, and mallard.

Black ducks are the predominant waterfowl species using the refuge.
© Mark Wilson

Shorebirds, Gulls, Terns and Allied Species

In the winter, double-crested cormorants and horned grebe are the waterbird species most commonly encountered on the refuge. Common long-legged waders at the refuge include great egret, snowy egret, and great blue heron.

Gulls and terns are frequently observed at the refuge. Herring and great black-backed gulls are the most common gull species, and least terns are the most abundant terns. Shorebirds commonly encountered include greater and lesser yellowlegs, American woodcocks, short-billed dowitchers, and willets.

Other Migratory Birds

Neotropical birds are a common component of the wildlife community, especially prairie, yellow, yellowthroat, and blue-winged warblers. Forty species of Neotropical migrants have been documented on the refuge, including a male rose-breasted grosbeak, an uncommon species during the breeding season on Long Island.

Mammals

The most common species in order of abundance are white-tailed deer, gray squirrel, eastern cottontail, and red fox.

Rare, Threatened or Endangered Species

Least and common terns, State-designated endangered and threatened species, respectively, are frequently observed foraging at the refuge aquatic habitats. Their numbers peak in May.

Ospreys, a New York State species of concern, are commonly observed from March through August roosting in trees and foraging in aquatic habitats on the refuge. Several nesting platforms exist on the refuge for breeding ospreys. Northern harriers, a State-listed threatened species, are observed occasionally foraging in the refuge grasslands and marshes.

Ospreys are a New York State species of concern.
© Janet C. Zinn *www.jczinn.com*

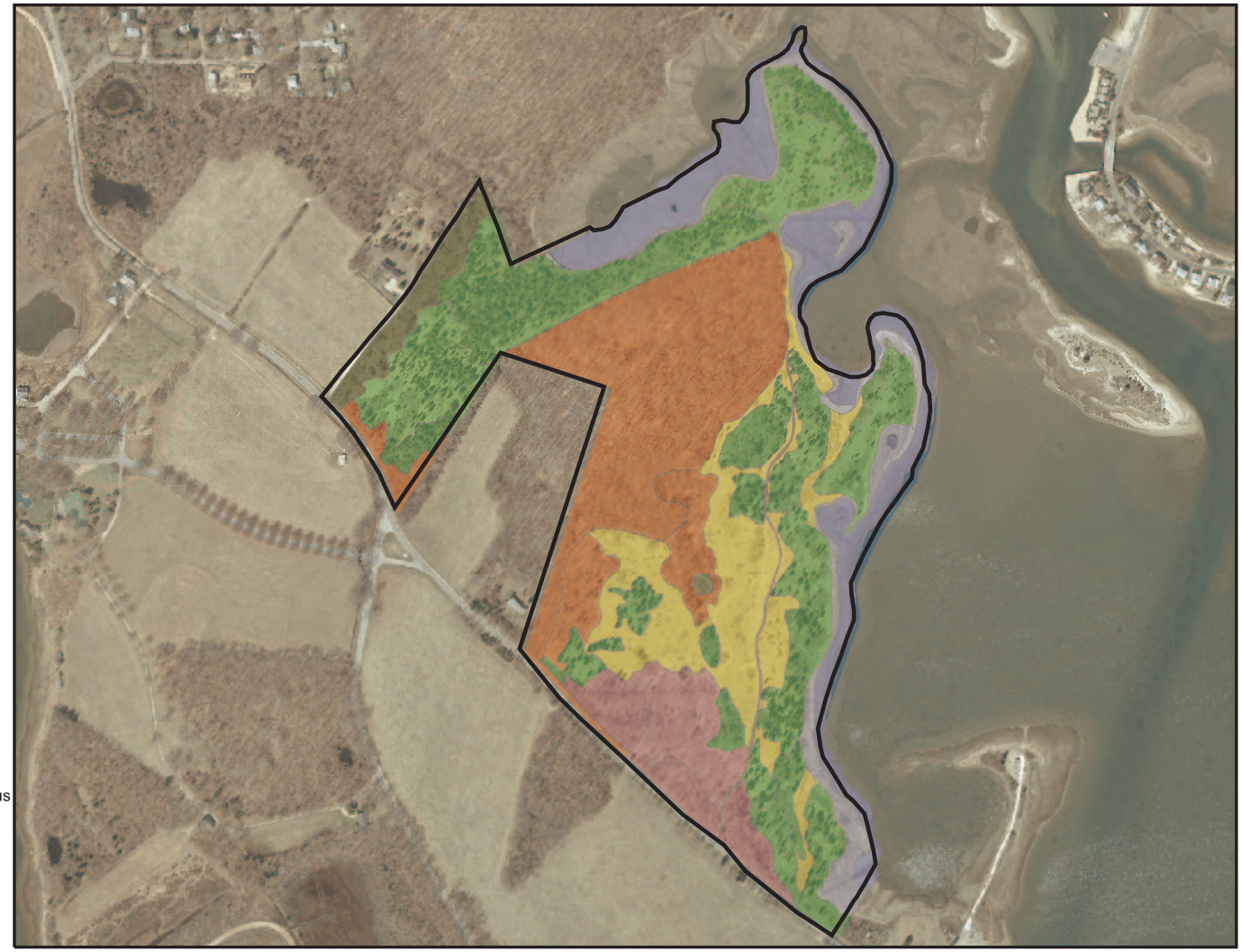
U.S. Fish & Wildlife Service

Map 3-2

Conscience Point National Wildlife Refuge

Suffolk County, New York

Vegetation Cover Map



Produced by Long Island NWR, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

1:6,141

0 0.1 0.2 Miles

0 0.1 0.2 0.3 Kilometers

N W E S

Elizabeth A. Morton National Wildlife Refuge

Morton National Wildlife Refuge, a 187-acre peninsula and its associated lands and waters, is located in Sag Harbor on the north shore of Long Island's south fork, Southampton Township. The peninsula, known by the local residents as Jessup's Neck, separates Little Peconic Bay from Noyack Bay (see map 3-3 on page 3-28 and map 3-4 on page 3-29).

Terrestrial Habitats

The position of those bays at Jessup's Neck makes Morton an extremely valuable area for a variety of waterbirds. The north-south axis of the peninsula between Long Island's two forks also makes the refuge an important migration corridor for a variety of terrestrial birds. The peninsula consists of 3 miles of undeveloped shoreline; one of the few shorelines without armoring or development that remain in the area. The tip of the Neck has steep, heavily eroded bluffs approaching 50 feet. Its habitats are varied, and include sand beach, salt marsh, freshwater marsh, brackish and freshwater ponds, lagoons, tidal flats, old fields and oak and cedar forests.

Upland areas at the refuge consist of brush, old fields and forest stands composed of mixed oak, red maple, pioneer and red cedar types. The dominant upland cover type is oak forest, classified by the New York State Heritage Program as a maritime oak forest, a vegetation type represented by only a few areas in the state. Other common upland habitats on the refuge include upland shrubs, which are dominated by honeysuckle and bayberry, grasslands, which are dominated by beach grass, and hardwoods, which are dominated by black cherry.

Refuge beaches are narrow, and consist of either sand or small stones in distinct zones. Shells are extremely abundant. Farther inland, beach grass and seaside goldenrod are abundant.

On the peninsula, the sand and stone beach slopes abruptly upward into heavily eroded sandy bluffs. The deciduous forest atop the peninsula has an open canopy of 30-foot to 40-foot oaks. Shrub growth is extremely dense and mixed, with a composition that includes bayberry, grape, and some sassafras. The more southern of the two patches of forest has trails, whereas the northern patch is nearly impenetrable. Two infrequently flooded brackish ponds lie between them. Floating and submerged algal growth is seldom flushed out and is, therefore, very thick. Shorebirds feed extensively there during fall migration. Ospreys are known to nest in dead cedar trees nearby.

The southern portion of the peninsula contains open water contiguous with Noyack Bay. These sheltered shorelines contain a fringe of smooth cordgrass grading into a high marsh zone of variable width. Several tidal flats also lie in the vicinity, some partially vegetated. Channel dredging for navigation is evident.

The inland portion of the refuge is mostly upland deciduous forest with a variety of other scattered cover types. Several eastern red cedar stands are also present. The main forest has mixed deciduous composition more diverse than typical Long Island oak-dominated woodlands. Many of these vegetation types, especially those adjacent to public-use areas, contain abundant invasive exotic plants such as garlic mustard, Asiatic bittersweet, Japanese honeysuckle, and Japanese barberry. Pothole-type depressions and small ponds are located on the peninsula and mainland.

Wetland Habitats

The dominant aquatic/wetland cover type at Morton is a beach habitat along the entire Jessup's Neck peninsula. The other two dominant wetland cover types are intertidal marsh and high marsh. Stands of great reed occupy only a small portion of the refuge, and are not considered as great a problem as on other Long Island refuges.

The effects of storms and the buildup of sediment regularly change the refuge shoreline. The apex of the Jessup's Neck peninsula, which consists of a sand and gravel bar, continues to expand toward Long Island's north fork. That bar is a favorite loafing spot for gulls, terns, shorebirds and cormorants.

A freshwater pond, prime habitat for mallards, wood ducks, wading birds, painted turtles and frogs, is located in the upland portion of the refuge. We can manipulate its water levels somewhat with a water control structure.

Fish and Wildlife

Birds

The refuge provides habitat for close to 300 species of birds. The refuge beach and its adjacent waters serve as habitat important for piping plovers, roseate terns, common terns, ospreys, and shorebirds. Sea duck species and American black ducks are common in winter. We direct our management at protecting federally listed beach-nesting species and migratory birds. Marine turtles, seals, and diverse fish species also use those waters.

The most common birds observed on or near the refuge include white-winged scoter, long-tailed duck, common goldeneye, black duck, and gulls. Other bird species of interest, because of a scarcity of sightings in the area, are fox sparrow, sharp-shinned hawk, hermit thrush, horned lark, snow bunting, and swamp sparrow.

Raptors

Sightings of sharp-shinned hawks, merlins, kestrels, and northern harriers are common at Morton as they move up and down the peninsula. Resident raptor species include great horned owl,

red-tailed hawk, and osprey. Screech owls roost in the wood duck nest boxes on the freshwater pond and are easily viewed by the public.

Waterfowl

The use of Morton and adjoining waters by waterfowl is highest in the winter months. Sea ducks, particularly white-winged scoter and common goldeneye, dominate. The tip of the Jessup's Neck peninsula receives the greatest use. Long-tailed ducks are found somewhat uniformly around the peninsula, and black ducks use the lagoon and brackish pond.

Shorebirds, Gulls, Terns and Allied Species

Snowy egret can be found on lagoons and ponds.
John Mosesso, Jr./NBII

Double-crested cormorants are observed year-round at the refuge, but numbers peak in spring and autumn. They feed in the bays adjacent to the refuge and loaf on the Jessup's Neck peninsula and adjacent pilings. Great cormorants appear sporadically, chiefly in winter. The refuge hosts common loons and horned grebes from September or October through May; however, numbers usually peak in November and December. Nearly 100 individuals of each species have been documented. Snowy egrets, great blue herons, great egrets, and green-backed herons also are common at Morton, usually on the lagoon and ponds.

Fourteen species of shorebirds and plovers have been observed at the refuge. Ruddy turnstones, black-bellied plovers, willets, and greater yellowlegs are the most common in the warmer months. Sanderlings are sighted on the beach in every month of the year, although they are more common in autumn and winter. American oystercatchers and whimbrels, uncommon to the Peconic Bay area, occasionally have been observed.

Gulls are conspicuous at the refuge. Their numbers are lowest in summer and higher the rest of the year. Approximately 200 gulls routinely loaf on the beach. About half of those are herring gulls, and half are great black-backed gulls. Tern species such as royal, Forster's, and arctic terns are also observed at Morton in late summer and early autumn.

Other Migratory Birds

Bank swallows nest on the western bluffs of Jessup's Neck. More than 100 burrows have been counted at the colony, estimated at 40 pairs. Volunteers monitor the use of songbird nest boxes on the refuge in the spring and summer. Tree swallows and house wrens are the most common species using the boxes.

Forty-six songbird species have been observed on the refuge. The most common include gray catbird, common yellowthroat, mourning

dove, yellow warbler, and robin. Forest interior species such as ovenbird, redstart, red-eyed vireo, wood peewee, and wood thrush have been detected using its relatively small acreage of mature forest.

Mammals

The most commonly sighted mammals at Morton include white-tailed deer, eastern chipmunk, eastern cottontail, gray squirrel, and red fox.

Marine Mammals

Seasonal sightings of harbor seals are common at Morton, either hauling out on the beach or swimming near inshore areas in March, November and December. Seal sightings on Long Island are continuing to increase.

Rare, Threatened or Endangered Species

Morton also provides habitat for several state- and federal-listed endangered or threatened species, including piping plovers, peregrine falcons, roseate, common, and least terns, Kemp's Ridley turtles and loggerhead sea turtles.

Rare wildlife species historically have used the Jessup's Neck portion of the refuge. Although we close most of that peninsula to the public for the late spring to midsummer breeding season, the public can observe all of those species from the part of the beach that remains open.

Piping plovers, federal-listed as threatened, arrive at Morton between mid-March and early April. Once a full clutch of eggs has been laid, the refuge erects an exclosure around the nest. Volunteers monitor hatching and fledging rates. The heaviest use of the refuge by plovers occurs in July: not only nesting adults and their young, but also adults and fledglings from other areas forage and loaf there. A maximum of 19 piping plovers has been documented in a single day.

The osprey, a state-listed species of concern, is a highly visible raptor at Morton. One to four pairs have nested on the refuge for the last three decades, and have successfully fledged young each year.

Terns are highly visible species at the refuge in late spring and early summer. The most common species include two state-designated threatened species, the common tern and the least tern, and a federal-listed endangered species, the roseate tern. The peninsula at Morton is a favorite loafing site, and the surrounding bays provide excellent foraging habitat for all tern species at that time of year. For the first time in many years, a least tern colony successfully fledged approximately 30 chicks in 2003, and has bred there in subsequent years. The refuge also serves as a local staging area for many terns before the breeding season.

U.S. Fish & Wildlife Service

Map 3-3

Vegetation Cover Map

Elizabeth A. Morton National Wildlife Refuge

Suffolk County, New York

- Refuge Boundary (187 Acres)
- Bridge
- Building
- Driveway
- Parking
- Paved Road
- Rock Beach
- Rocky Slope
- Sand Beach
- Sandy Slope
- Trail
- Unpaved Road
- Water

Vegetation Cover

- Black Locust Successional Forest (*Robinia pseudoacacia* Forest)
- North Atlantic Low Salt Marsh *Spartina alterniflora* / (*Ascophyllum nodosum*) Acadian/Virginian Zone Herbaceous Vegetation
- Northeastern Dry Oak - Hickory Forest *Quercus (alba, rubra, velutina)* / *Cornus florida* / *Viburnum acerifolium* Forest
- Northern Tall Maritime Shrubland *Amelanchier canadensis - Viburnum spp. Morella pensylvanica* Shrubland
- Old-field Red-cedar Forest *Juniperus virginiana* Forest
- North Atlantic High Salt Marsh *Spartina patens - Distichlis spicata - (Juncus gerardii)* Herbaceous Vegetation
- Reed-grass Marsh *Phragmites australis* Tidal Herbaceous Vegetation
- Salt Shrub *Baccharis halimifolia - Iva frutescens* / *Spartina patens* Shrubland
- Sandplain Grassland *Morella pensylvanica* / *Schizachyrium littorale - Danthonia spicata* Shrub Herbaceous Vegetation
- Coastal Oak / Heath Forest *Quercus coccinea - Quercus velutina* / *Sassafras albidum* / *Vaccinium pallidum* Forest
- Eastern Reed Marsh (*Phragmites australis* Eastern North America Temperate Semi-natural Herbaceous Vegetation
- Lower New England Red Maple Swamp *Acer rubrum - Fraxinus (pennsylvanica, americana)* / *Lindera benzoin* / *Symplocarpus foetidus* Forest
- Maritime Red-cedar Woodland *Juniperus virginiana* / *Morella (=Myrica) pensylvanica* Woodland
- Successional Maritime Forest *Prunus serotina - Sassafras albidum - Amelanchier canadensis* / *Smilax rotundifolia* Shrubland
- Turf Grass

1:18,951

0 0.5 1 Miles

0 0.5 1 1.5 Kilometers

N W E S

Produced by Long Island NWR, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

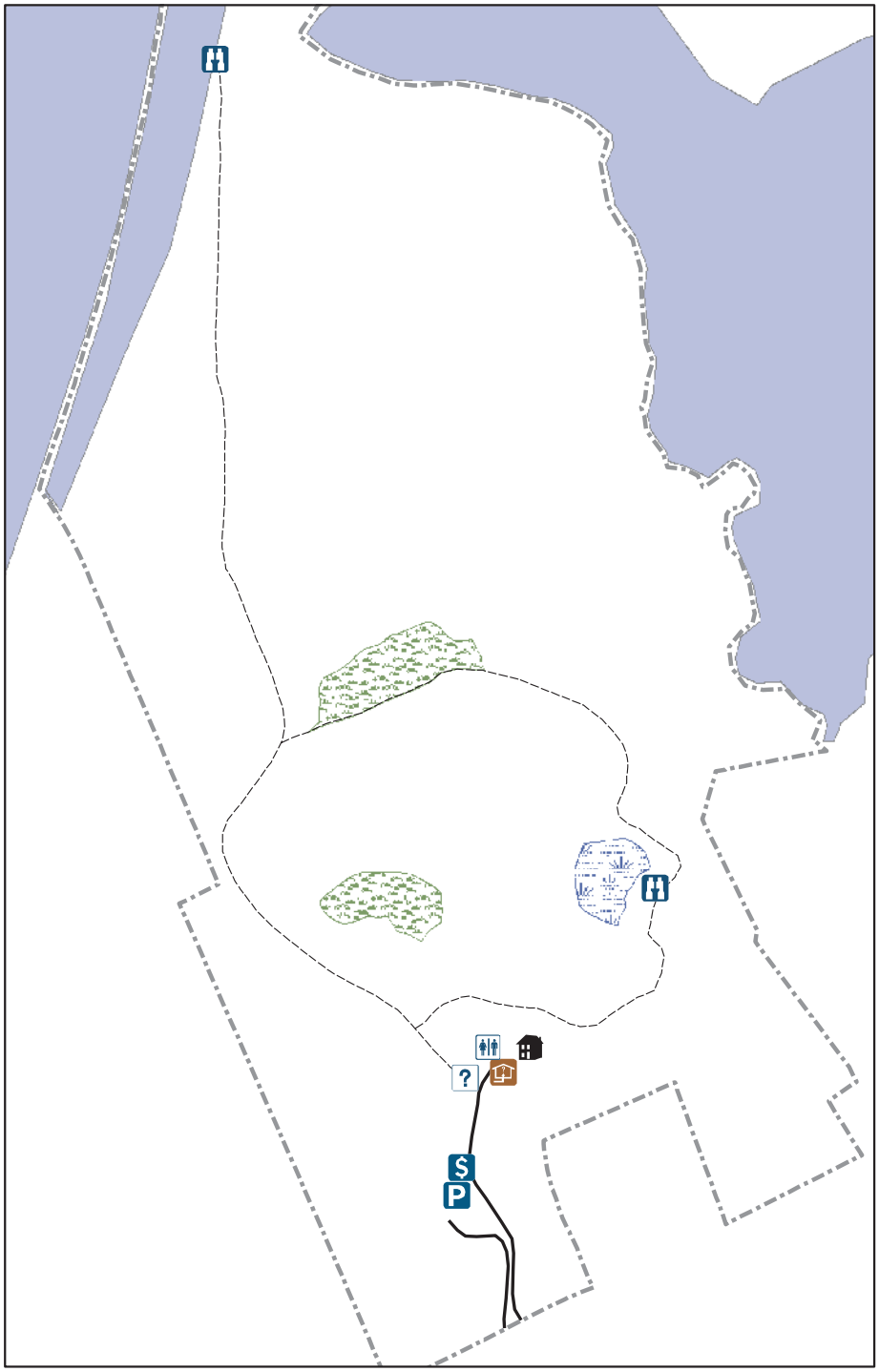
U.S. Fish & Wildlife Service

Map 3-4

Elizabeth A. Morton National Wildlife Refuge

Suffolk County, New York

Facilities and Trails Map



- Fee Station
- Information Kiosk
- Parking Lot
- Platform
- Refuge Housing
- Refuge Office
- Restroom
- Nature Trails
- Access Road
- Refuge Boundary (187 Acres)
- Open Field
- Pond

1:4,200

0 0.1 0.2 Miles

0 0.1 0.2 0.3 Kilometers

N W E S

Produced by Long Island NWR Complex, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

Lido Beach Wildlife Management Area

Lido Beach is located on the bay side of Long Beach, on a barrier island west of Jones Inlet in Nassau County. Like the rest of Hempstead Bay, it lies in the vicinity of dense residential and commercial development (see map 3-5 on page 3-32).

Terrestrial Habitats

Lido Beach consists of 22 acres of salt marsh and shrub thickets. Dense stands of great reed and a mixture of upland shrubs and grasses dominate the marsh/upland edge. The shrub thickets of Lido Beach consist of red mulberry, groundsel bush, bayberry, and great reed. The thickets provide roosting and nesting habitat for various long-legged wading birds, particularly black-crowned night-herons.

An abandoned Nike missile pad lies next to the management area. The rectangular, flat-topped, 4.6 acre hill overlooking the marsh is undergoing succession much in the manner of an abandoned parking lot. Common species are ragweed, goldenrod, blackberries, and poison ivy along the edges of the pad.

Wetland Habitats

The marsh at Lido Beach is a typical mixture of salt hay and salt grass; some black grass, glassworts, and smooth cordgrass also are present. Approximately 45 percent of Lido Beach is ditched high salt marsh. That ditching is deep, and well-flushed by daily tides. Two mudflats on the marsh are being pioneered by glasswort species. The mud flats provide an excellent foraging area for a variety of shorebirds.

Aquatic Habitats

Lido Beach is part of the Hempstead estuary, which is noted for its impressive concentrations of waterfowl, long-legged waders, terns, and shorebirds. Hempstead Bay is one of the largest undeveloped coastal wetland ecosystems in New York. Although small in size and forming only a modest portion of the Bay, Lido Beach provides important habitat for wetland-dependent wildlife.

Fish and Wildlife

The Wildlife Management Area consists primarily of tidal wetland. The diversity of shorebirds and wading bird is high, as is the use by waterfowl, particularly black ducks and Atlantic brant in winter. The area supports nesting clapper rails, black-crowned night-herons and osprey, as well as numerous songbirds such as sharp-tailed sparrows. Its location on a barrier island makes it an excellent habitat for migrating songbirds and raptors.

Birds

Raptors

Northern harriers, sharp-shinned hawks, and ospreys are commonly observed at Lido Beach.

Waterfowl

Waterfowl sightings are numerous and diverse. The species most commonly observed are black ducks, mallards, Atlantic brants, Canada geese, and long-tailed ducks (oldsquaws). In January, the numbers of Atlantic brants and black ducks peak at 2,000 and 75.

Shorebirds, Gulls, Terns and Allied Species

Eight species of herons, egrets and ibises have been observed at Lido Beach. Other marsh and waterbird species observed include double-crested cormorant, great cormorant, clapper rail, and belted kingfisher.

The Hempstead Harbor is known for its concentrations of shorebirds during migration. Plovers and sandpipers are commonly observed at Lido Beach. Occasionally, such shorebird species as whimbrels, marbled godwits, and pectoral sandpipers may be observed in the management area. Willets nest there in early summer, and glossy ibis have been sighted roosting on the piles of dredge spoil.

Gulls are commonly observed at Lido Beach. Sightings of Bonaparte's gulls are accidentals in the area. Common, least, and royal terns are usually observed from April through July.

Rare, Threatened or Endangered Species

Least terns, a state-listed threatened species, are observed at Lido Beach from May through July. Ospreys, a state-designated species of concern, are observed from February through August. Northern harriers, a state-listed threatened species, are present from December through February.

Magnolia warbler
© S. Pollack

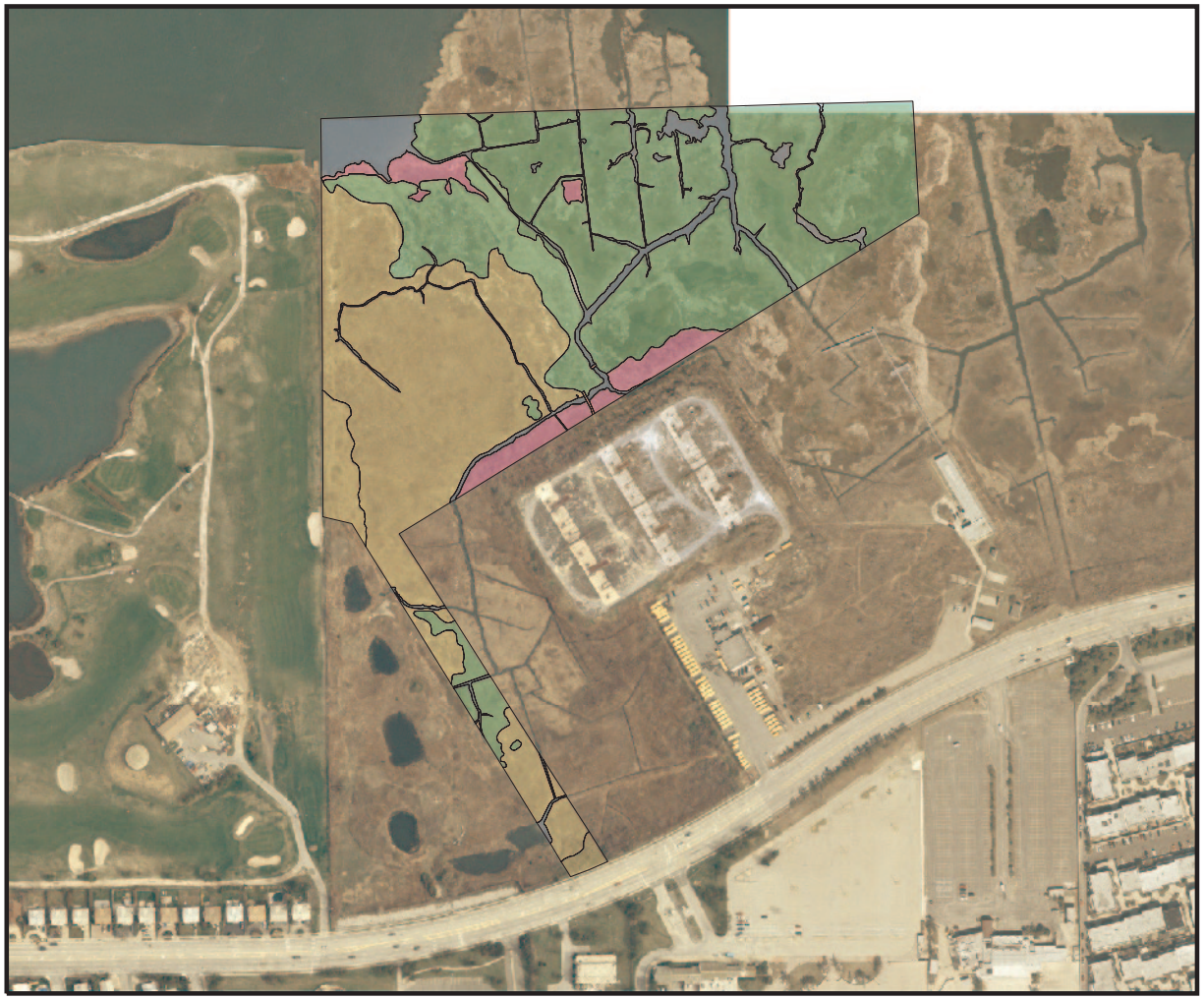
U.S. Fish & Wildlife Service

Map 3-5

Lido Beach Wildlife Management Area

Nassau County, New York

Vegetation Cover Map



Refuge Boundary (22 Acres)

Vegetation Cover

- Bridge
- Water
- North Atlantic High Salt Marsh *Spartina patens - Distichlis spicata - (Juncus gerardii)* Herbaceous Vegetation
- Northern Tall Maritime Shrubland *Amelanchier canadensis - Viburnum spp. - Morella pensylvanica* Shrubland
- Reed-grass Marsh *Phragmites australis* Tidal Herbaceous Vegetation

Produced by Long Island NWR Complex, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

1:5,083

0 0.1 0.2 Miles

0 0.1 0.2 0.3 Kilometers

N W E S

Oyster Bay National Wildlife Refuge

Oyster Bay National Wildlife Refuge is located on the north shore of Long Island in eastern Nassau County in the Town of Oyster Bay. It is 20 miles east of New York City and 5 miles west of Target Rock. The major refuge holdings are in Oyster Bay Harbor and the western portion of Cold Spring Harbor. The waters of Oyster Bay surround Sagamore Hill National Historic Site, home of Theodore Roosevelt, the founder of the first national wildlife refuge. Please note that "Oyster Bay" in this document refers to Oyster Bay National Wildlife Refuge. See map 3-6 on page 3-36, and map 3-7 on page 3-37.

Wetland Habitats

The refuge includes more than 3,000 acres of bay bottom and surface waters up to the mean high tide line, in addition to the channels and marshes of Frost, Oak Neck, and Mill Neck creeks. Mill Pond is an 8-acre freshwater pond that drains into Oyster Bay Harbor at Beekman Beach. The refuge consists largely of subtidal habitats 2 m to 9 m in depth, linear strands of intertidal salt marsh, and a minor extent of high salt marsh and freshwater wetlands.

Aquatic Habitats

Oyster Bay is the largest refuge in the Complex. Its 3,204 acres of bay bottom, salt marsh, and a small freshwater wetland are managed principally for use by migratory waterfowl and other waterbirds. It is also one of the few bay-bottom refuges owned and managed by the Service. Bay bottom composes 78 percent of the refuge; unconsolidated shoreline, 3 percent; *Spartina alterniflora* fringe along the shore, 5 percent; high marsh at the west end of the harbor, 5 percent; and an estuarine stream bed makes up the remainder, approximately 9 percent. The refuge is located off Long Island Sound, and the sheltered nature of the bay makes it extremely attractive as winter habitat for a variety of waterfowl species, especially diving ducks.

The State of New York has designated the Oyster Bay area as a Significant Coastal Fish and Wildlife Habitat. Marine wildlife common to the refuge includes harbor seals, diamondback terrapins, and several species of sea turtles. Shellfish and finfish are abundant at Oyster Bay. The bay supports the only commercial oyster farm aquaculture operation remaining on Long Island, and an estimated 90 percent of the commercial oysters in New York originates from areas associated with the refuge.

Oyster Bay receives the greatest amount of public use of any refuge on Long Island. Recreational boaters use it heavily from May through September: on peak weekends, approximately 3,000 boats use the refuge; on weekdays, 1,000 boats per day are common. The construction and expansion of un-permitted docks and other shoreline structures is a major concern on the refuge, as is general water quality.

Fish and Wildlife

More than 126 bird species have been documented at the refuge, including 23 species of waterfowl. Numerous waterfowl species overwinter in Oyster Bay; more than 20,000 ducks have been reported for one survey during peak use. The other waterbirds the refuge supports in large numbers include double-crested cormorants, Forster's and common terns, wading birds, and shorebirds. Certain areas of Oyster Bay, like Mill Neck Creek and Frost Creek, provide breeding habitat for black duck, clapper rail, and osprey.

Birds

Raptors

Ospreys, a state-designated species of concern, nest and have successfully fledged their young along the Mill Neck Creek marsh. Other raptor species observed at Oyster Bay include the northern harrier, red-tailed hawk, American kestrel, merlin and sharp-shinned hawk.

Waterfowl

Oyster Bay has the greatest winter waterfowl use of any of the Long Island refuges. The numbers of waterfowl using Oyster Bay are lowest from May through August, and start to increase in September and October. Puddle ducks such as black ducks, gadwall, and mallards start migrating to the refuge in early autumn, and their diversity begins to increase in November. Waterfowl numbers peak and remain high from December through March, then decline in April. The New York Department of State has singled out Oyster Bay as having the greatest concentration of waterfowl on Long Island's north shore.

The three waterfowl species that most commonly use the refuge in winter include the greater scaup, bufflehead, and black duck. Those species compose approximately 85 percent of all ducks using the refuge. Greater scaup compose more than half; bufflehead make up 20 percent; and black duck, the most common puddle duck species, close to 10 percent.

Waterfowl use is not uniform across the refuge. The Bayville, Cold Spring Harbor, and Mill Neck Creek areas support in excess of 80 percent of that use. Bayville alone accounts for nearly half. The majority of the greater scaup and bufflehead on the refuge use its Bayville and Cold Spring Harbor sections, while the Mill Neck Creek section had the greatest use by black duck and canvasback.

Shorebirds, Gulls, Terns and Allied Species

The most common waterbird on the refuge is the double-crested cormorant, which is seen year-round. Its numbers are highest from

April through October. Great cormorants appear at low numbers in the winter. Other waterbirds that use the refuge include loons, grebes, herons, and egrets.

Gulls are common on the refuge, and normally reach a maximum of about 1,500 birds in the winter. Herring gulls are more numerous in winter than in the warmer months. Great black-backed gulls are present year-round, but are less numerous than herring gulls. Ring-billed gulls also are common in the winter months but they, too, are fewer than herring gulls. Laughing gulls use the refuge in the summer, and Bonaparte's gulls in the winter.

Terns use Oyster Bay from May through October. Common and least tern use is heaviest from May through August. Forster's terns are present on the refuge in good numbers in September and October.

Seven species of shorebirds are commonly observed on the refuge. The most common include black-bellied plovers, dunlins, greater yellowlegs, and least and spotted sandpipers.

Mammals

Harbor seals are observed on the refuge primarily in March.

Reptiles and Amphibians

The northern diamondback terrapin is common at Oyster Bay, particularly in the Frost Creek and Mill Neck Creek sections. The refuge is considered to have one of the largest populations of diamondback terrapins on Long Island.

Rare, Threatened or Endangered Species

Federal- and state-designated endangered or threatened species known to use Oyster Bay include the bald eagle, peregrine falcon, northern harrier, least tern, and Kemp's ridley and loggerhead sea turtles. Peregrine falcons typically migrate through Oyster Bay in the autumn and spring. Bald eagles visit the refuge sporadically in winter. Ospreys nest and have successfully fledged young on the refuge. Northern harriers are observed in their spring and autumn migrations. Atlantic loggerhead and Kemp's ridley sea turtles are known to forage in Oyster Bay. However, sightings of the turtles are rare, and on those occasions they are usually the victims of an injury or cold stunning.

Harbor seals
John Mosesso, Jr./NBII

U.S. Fish & Wildlife Service

Map 3-6

Oyster Bay National Wildlife Refuge - Frost Creek Unit

Nassau County, New York

Vegetation Cover Map

Refuge Boundary (84 Acres)

Bridge

Sand Beach

Sand

Water

Vegetation Cover

Turf Grass

Acer rubrum - *Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus* Forest

Robinia pseudoacacia Forest

Reed-grass Marsh *Phragmites australis* Tidal Herbaceous Vegetation

Salt Shrub *Baccharis halimifolia - Iva frutescens / Spartina patens* Shrubland

North Atlantic Low Salt Marsh *Spartina alterniflora / (Ascophyllum nodosum)* Acadian / Virginian Zone Herbaceous Vegetation

1:13,312

0 0.25 0.5 Miles

0 0.25 0.5 0.75 Kilometers

N W E S

Produced by Long Island NWR Complex, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

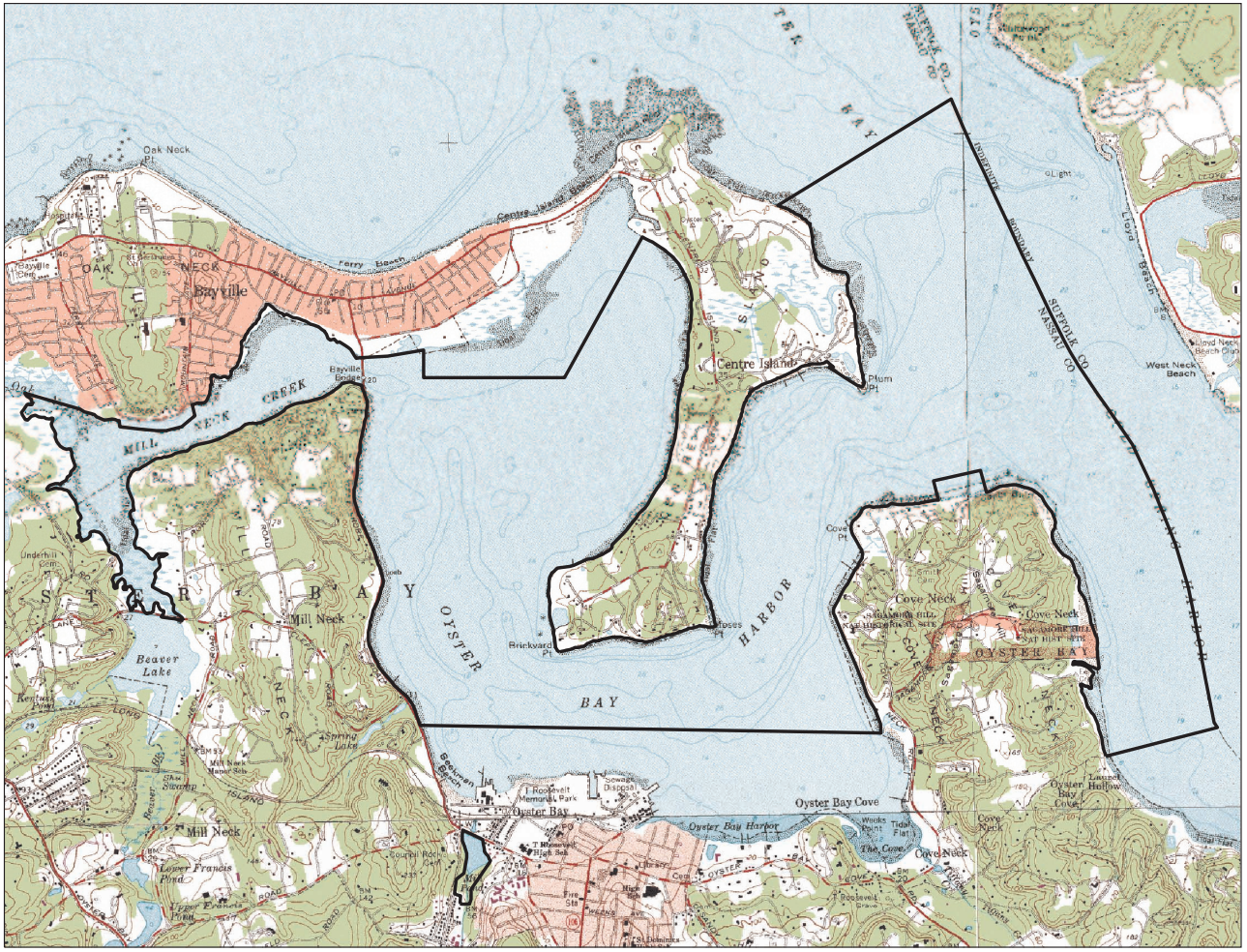
U.S. Fish & Wildlife Service

Oyster Bay National Wildlife Refuge

Nassau County, New York

Map 3-7

Topographic Map



1:44,501

0 1 2 Miles

0 1 2 3 Kilometers

Produced by Long Island NWR Complex, Shirley, New York
Bathymetric DEM: USGS National Mapping Program
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

Sayville Unit

Sayville, a sub-unit of Wertheim, is located in West Sayville, New York, about 2 miles inland from the Great South Bay. This is the only land-locked refuge in the Complex (see map 3-8 on page 3-40).

Terrestrial Habitats

Sayville, and its associated 101-acre FAA property, consists primarily of pitch pine and scrub oak stands, interspersed with grasslands dominated by little bluestem. The FAA property supports the largest population in New York State of the federally listed endangered sandplain gerardia. The continual management of sandplain gerardia at Sayville and other Complex refuges is vital for its recovery. The FAA was legally mandated to transfer the 101-acre property to the Service after the buildings were removed. At this point, the buildings have been removed, but the property has yet to be transferred.

A variety of terrestrial migratory birds uses the refuge, and the potential exists for attracting more grassland-dependent birds.

Fish and Wildlife

The lack of surface waters at Sayville limits its species diversity to terrestrial species. Its terrestrial habitats, young pitch pines, scrub oaks, and grasslands, provide excellent habitat for Neotropical migratory birds and resident passerines.

Birds

Raptors

Sayville provides important migratory habitat for certain raptor species, particularly American kestrel, and sharp-shinned, Cooper's, and red-tailed hawks.

Other Migratory Birds

Songbirds are a conspicuous component of species at Sayville. That songbird community is diverse, and includes many Neotropical migrant species. Breeding songbirds dominant in forested habitats include the ovenbird, American redstart, common yellowthroat, gray catbird, and rufous-sided towhee. Breeding songbirds dominant in shrub and grassland habitats include song sparrows, swallows, and blue-winged, yellow, and prairie warblers.

Mammals

Dominant terrestrial mammals include white-tailed deer, eastern cottontail, gray squirrel, eastern mole, eastern chipmunk, white-footed mouse, meadow vole, red fox, opossum, short-tailed shrew, and raccoon.

Reptiles and Amphibians

Eastern box turtles and eastern hognose snakes are of interest because of their perceived current decline on Long Island, where both were once considered abundant, dominant species.

Rare, Threatened or Endangered Species

On September 7, 1988, sandplain gerardia was listed as an endangered species under the provisions of the Endangered Species Act of 1973, as amended. The plant is known to grow at two sites on Cape Cod, six sites on Long Island, one site in Baltimore County, Maryland, and one site in Washington County, Rhode Island. Its overall population has declined from 49 historical records to the 10 populations that remain today. Its decline can be attributed to the loss and degradation of suitable habitat caused by increased development, vegetative succession, and changing historical disturbance regimes.

Ruby red-throated hummingbird
John Mosesso, Jr./NBII

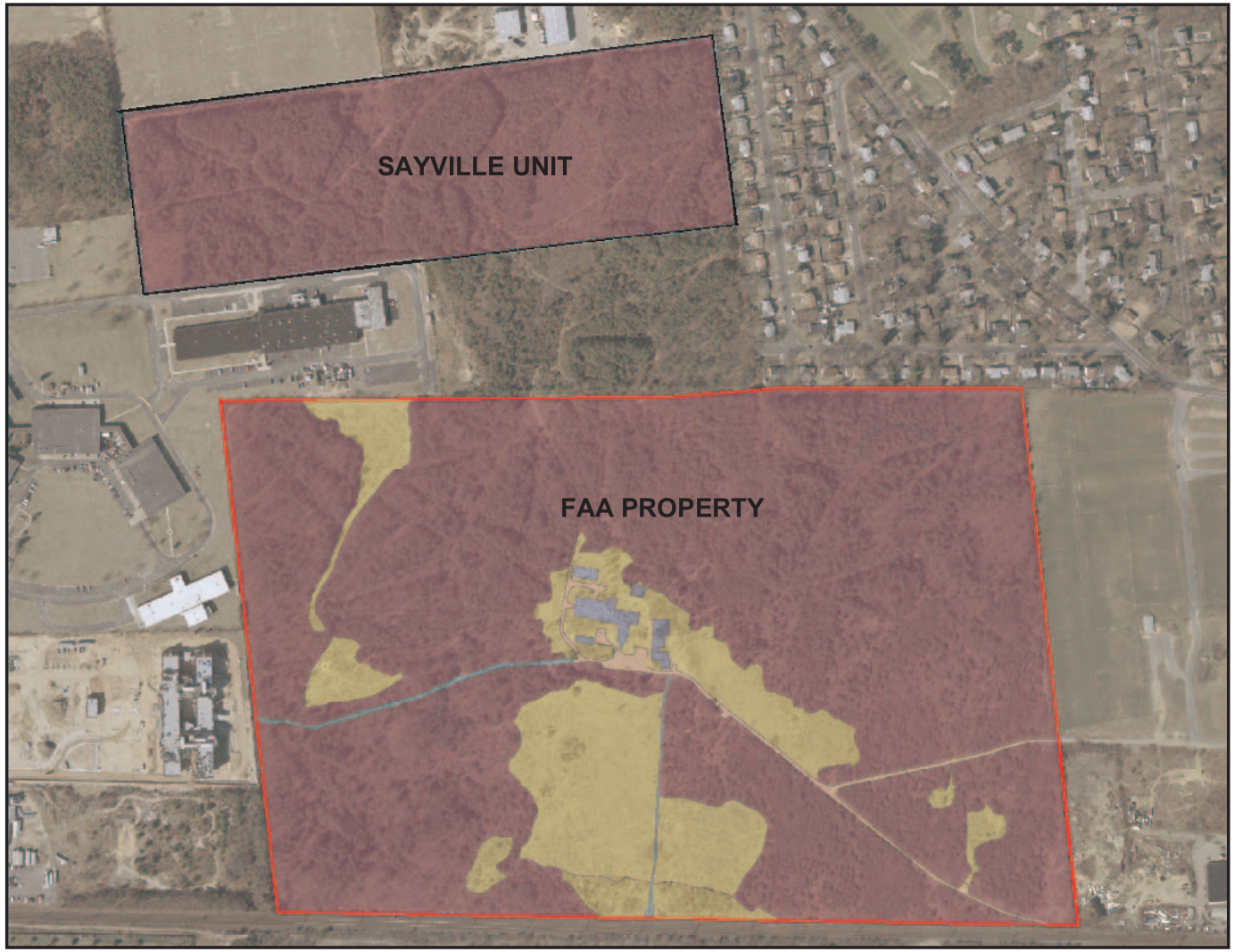
U.S. Fish & Wildlife Service

Map 3-8

Sayville Unit of Wertheim National Wildlife Refuge and FAA Site

Suffolk County, New York

Vegetation Cover Map



Unit Boundary (26 Acres)

FAA Property Boundary (101 Acres)

Building

Dirt Path

Driveway

Sidewalk

Paved Road

Slab

Vegetation Cover

Old-field Red-cedar Forest *Juniperus virginiana* Forest

Pitch Pine - Oak Coastal Forest *Pinus rigida - Quercus coccinea / Vaccinium pallidum - (Morella pensylvanica)* Forest

Produced by Long Island NWR Complex, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

1:6,091

0 0.1 0.2 Miles

0 0.1 0.2 0.3 Kilometers

N W E S

Seatuck National Wildlife Refuge

Seatuck is located on Long Island's south shore in Islip, New York. The refuge borders the National Audubon Scully Sanctuary to the west, suburban development to the north, Champlin Creek to the east, and Great South Bay to the south. We acquired the 196-acre refuge in 1968 by donation from the Peters family under the Migratory Bird Conservation Act *"...for use as an inviolate sanctuary, or for any other management purposes, for migratory birds"* (1929). See map 3-9 on page 3-44 and map 3-10 on page 3-45.

Terrestrial Habitats

Upland habitats including old fields, brush, and woodland form about one-half of Seatuck. The upland habitats are equally divided among mixed-oak woodland, red maple stands, upland shrub, and grasslands. Pine barren habitat also is present. The grasslands are about equally divided between cool season and warm season grassland types.

The wildlife attracted to the upland areas includes nesting purple martins, white-tailed deer, red fox and songbirds. The coastal setting and habitats appeal to numerous migrating raptors. Our management includes protecting forest, managing grassland, controlling invasive species, maintaining nesting structures, and restoring derelict lands.

Wetland Habitats

The remaining half of the refuge is salt marsh, consisting largely of salt hay and expansive salt pannes. Stands of great reed intermix in the marsh, and also form a wide buffer along its upland edge. Freshwater wetlands and ponds also are present. The bulk of the aquatic habitats include salt marsh and subtidal types. The numerous wildlife species present include waterfowl, shorebirds, wading birds, and nesting ospreys.

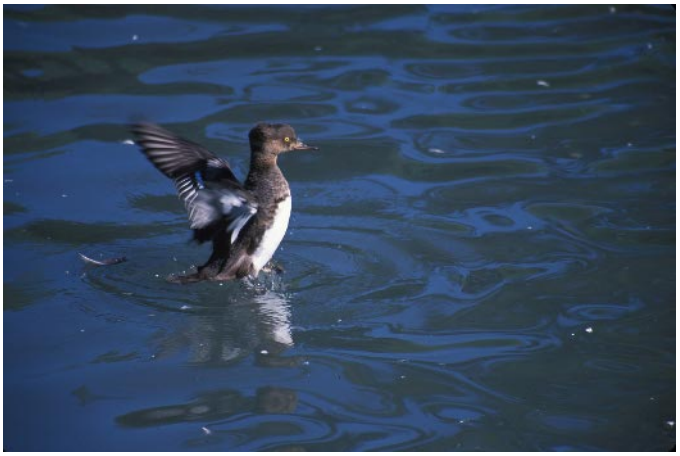
Fish and Wildlife

Seatuck is essentially an island of wildlife habitat surrounded by suburban development. More than 210 avian species have been documented at the refuge. Mammals, including white-tailed deer, raccoon and red fox, are common and conspicuous. Ospreys, a state species of special concern, nest on the refuge. Peregrine falcons routinely have been observed. Waterfowl, including black ducks, are present year-round, but are most common in winter. Wading birds and shorebirds are conspicuous at the refuge. In the breeding and migrating seasons, songbirds are found in various upland areas.

Birds

Raptors

Seatuck provides important habitat for raptors moving along the Long Island coast. They are commonly observed at the refuge in their spring and autumn migrations.



Red-breasted merganser
John Mosesso, Jr./NBII

Waterfowl

Seventeen species of waterfowl have been observed on the refuge. Long-tailed ducks are observed in January and April. Black duck, greater scaup, bufflehead, and red breasted merganser are present in their greatest numbers in late fall and winter. Green-winged teals are fairly common in the autumn.

Shorebirds, Gulls, Terns and Allied Species

Nine species of herons, egrets and ibises are commonly observed on the refuge. Great blue herons, snowy egrets, green-backed herons, and great egrets are most common. The number of long-legged wading birds peaks in August, and there is a smaller peak earlier in April. American bitterns are conspicuous in the winter and, surprisingly, a least bittern, rare for Long Island, has been observed on the refuge.

Four species of gulls (herring, great black-backed, ring-billed, and laughing) are commonly observed on the refuge. Herring gulls are the most abundant, and are present year-round. Least and common terns are observed there from May through August.

Other shorebirds observed include yellowlegs, sandpiper, black-bellied plover, killdeer, dunlin, and willet. Shorebird numbers peak in August, but high numbers are also present in May, July and September.

Other Migratory Birds

Birds that depend upon forest edges, shrubs, and wetlands are most prevalent. On the whole refuge, the most common birds detected are red-winged blackbird, common yellowthroat, tree swallow, gray catbird, American crow, sharp-tailed sparrow, mourning dove, and northern cardinal.

Mammals

White-tailed deer are the most conspicuous and controversial wildlife species at Seatuck. The herd has a high density, and neighbors frequently voice complaints about the damage it causes. They have also expressed concerns about the potential for deer-vehicle collisions and the incidence of Lyme disease in the community. Other species resident on the refuge include gray squirrel, mice, vole, shrew, eastern cottontail, red fox, raccoon, and feral cat.

Fish

After a salt marsh restoration in 1992, both the diversity and abundance of fish species increased dramatically. Ecologically, these forage fish contribute significantly to the food web in the Great South Bay estuary. The species most commonly observed are the sheepshead minnow, banded killifish, and marsh killifish. Others observed include the Atlantic silverside, American eel, mosquitofish, menhaden, stickleback, and striped killifish.

Rare, Threatened or Endangered Species

Ospreys, a New York State species of special concern, have been increasing on Long Island for the past 5 years. They have nested at Seatuck since 1983, with a notable increase in the number of nests and production there. Common terns and least terns, State-listed species, forage in the refuge shallows between May and August.

Eastern gray squirrel
John Mosesso, Jr./NBII

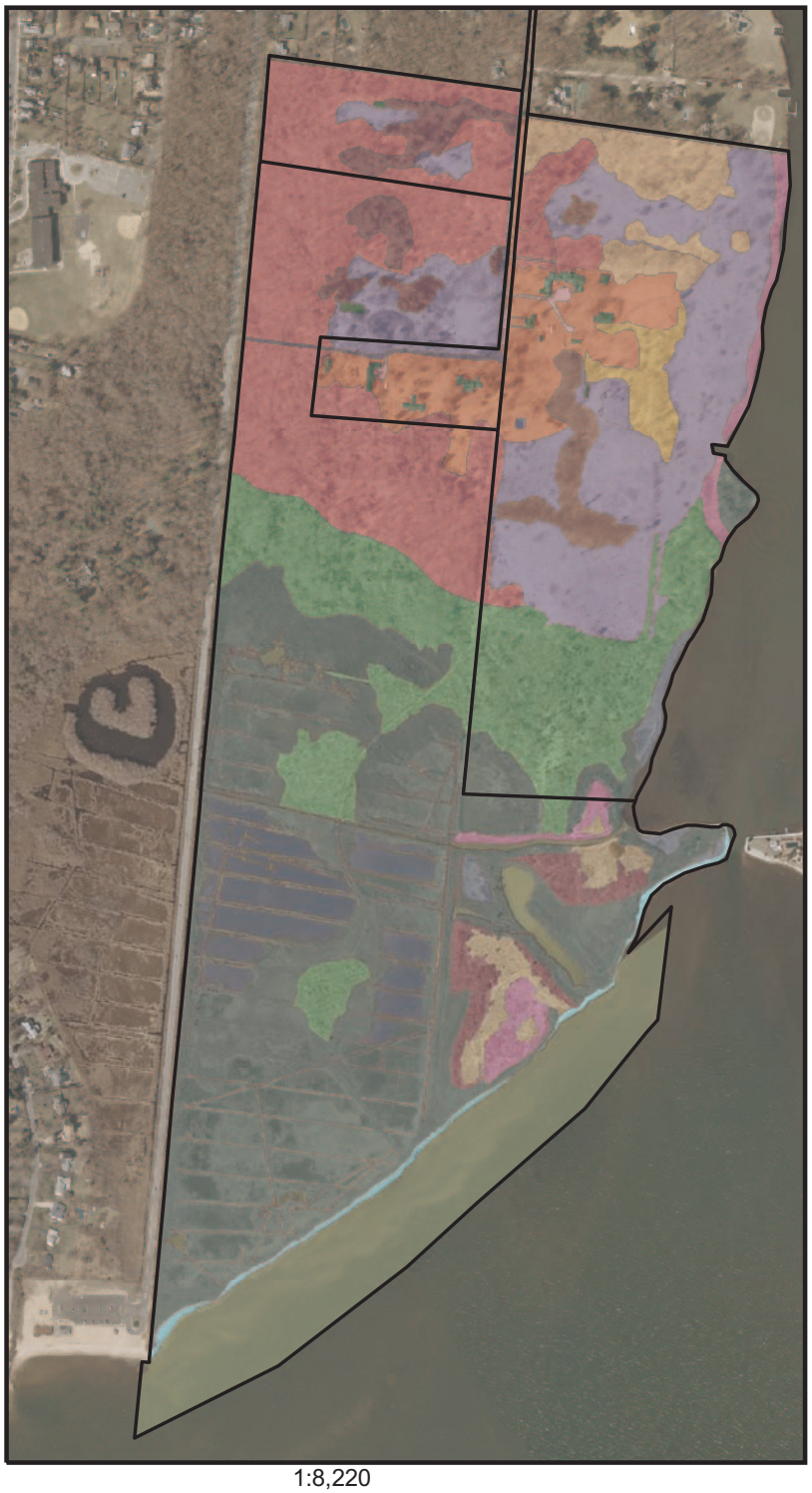
U.S. Fish & Wildlife Service

Map 3-9

Seatuck National Wildlife Refuge

Suffolk County, New York

Vegetation Cover Map



Refuge Boundary (209 Acres)

- Building
- Dirt Driveway
- Dirt Road
- Paved Road
- Sand
- Sand Beach
- Water
- Turf Grass

Vegetation Cover

- Black Locust Successional Forest *(Robinia pseudoacacia* Forest)
- Coastal Oak - Beech Forest *Fagus grandifolia - Quercus alba - Quercus rubra* Forest
- Coastal Oak / Heath Forest *Quercus coccinea - Quercus velutina / Sassafras albidum / Vaccinium pallidum* Forest
- Lower New England Red Maple Swamp *Acer rubrum - Fraxinus (pennsylvanica, americana) / Lindera benzoin / Symplocarpus foetidus* Forest
- North Atlantic High Salt Marsh *Spartina patens - Distichlis spicata - (Juncus gerardii)* Herbaceous Vegetation
- Pitch Pine - Oak Coastal Forest *Pinus rigida - Quercus coccinea / Vaccinium pallidum - (Morella pensylvanica)* Forest
- Reed-grass Marsh *Phragmites australis Tidal* Herbaceous Vegetation
- Salt Shrub *Baccharis halimifolia - Iva frutescens / Spartina patens* Shrubland
- Sandplain Grassland *Morella pensylvanica / Schizachyrium littorale - Danthonia spicata* Shrub Herbaceous Vegetation
- Successional Maritime Forest *Prunus serotina - Sassafras albidum - Amelanchier canadensis / Smilax rotundifolia* Shrubland

1:8,220

0 0.2 0.4 Miles

0 0.2 0.4 0.6 Kilometers

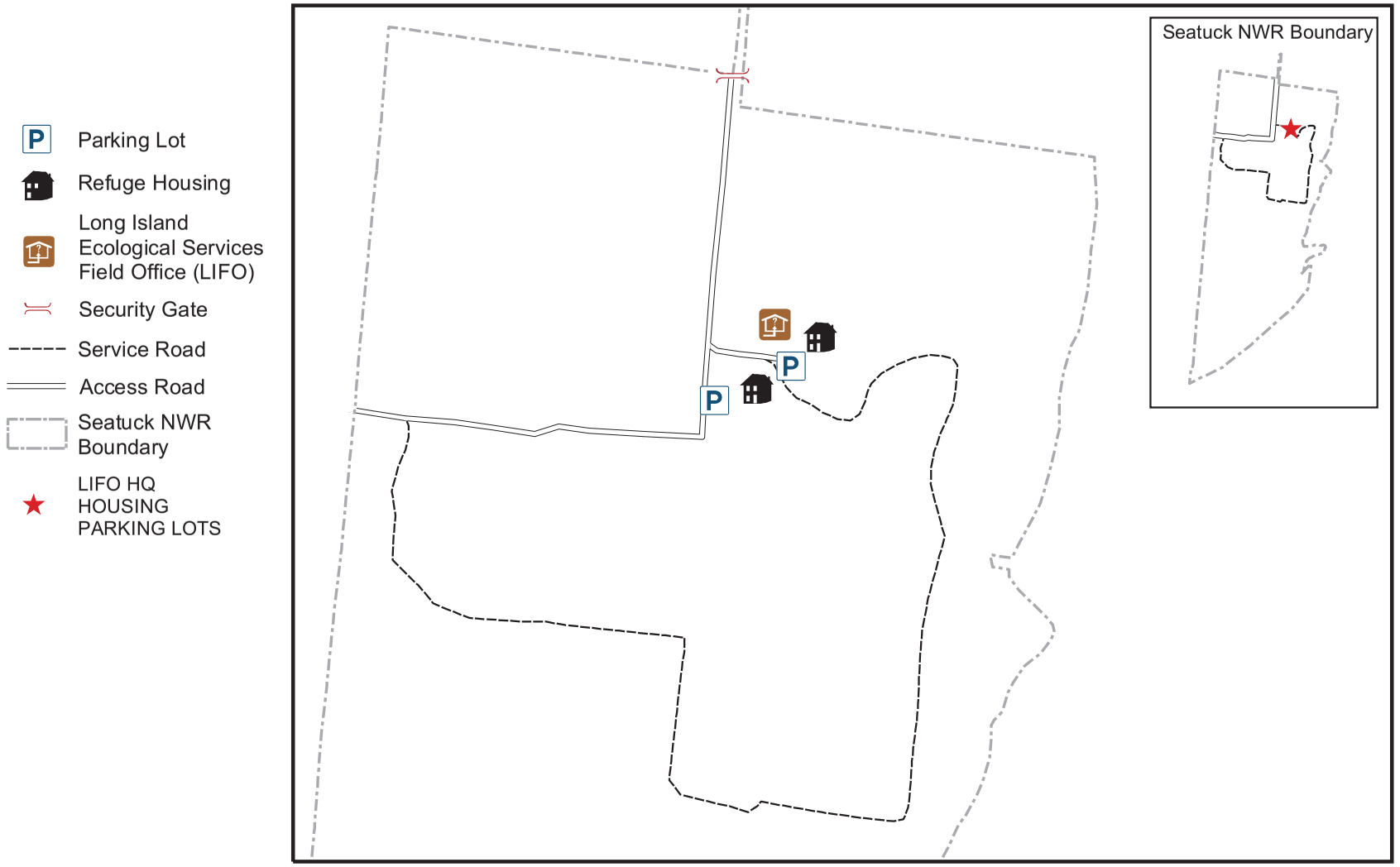
N W E S

Produced by Long Island NWR Complex, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

U.S. Fish & Wildlife Service

Seatuck National Wildlife Refuge
Suffolk County, New York

Map 3-10
Facilities and Trails Map



Produced by Long Island NWR Complex, Shirley, New York
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

Target Rock National Wildlife Refuge

Target Rock is an 80-acre refuge of mixed upland forest in varying stages of succession, a half-mile rocky beach along Huntington Bay, a brackish pond and several vernal ponds. The refuge is located on the north shore of Long Island in western Suffolk County. See map 3-11 on page 3-49, and map 3-12 on page 3-50.

Terrestrial Habitats

The refuge consists largely of mature oak forest characteristic of Long Island's north shore. Dominant tree species include the black oak, red oak, white oak, hickory and tulip tree. The canopy is open, and individual trees in many cases are 60 feet to 80 feet in height. The understory is largely composed of maple-leaved viburnum and mountain laurel, although the presence of other shrubs and vines creates impenetrable tangles where the canopy is even more open. Other terrestrial habitats include forest openings, red maple forest, and bluffs. The areas of sand ridge have juniper trees, which provide habitats for "olive" juniper hairstreak butterflies. The eastern prickly pear cactus, a state-protected species, is found in the sand ridge areas of the beach.

Wetland Habitats

The refuge contains a 1 acre brackish pond surrounded by marsh elder and saltmeadow cordgrass. A small outlet to the south connects it to regular tidal flow.

Aquatic Habitats

The Target Rock beach is regularly flooded. Its exposed, stony shoreline consists of rocks ranging in size from gravel to cobble. Boulders in the bay can measure several feet in height, and rest on two tidal flats thickly encrusted with blue mussels. Inland from the shore, the substrate becomes progressively sandier. Uplands adjacent to the beach are dominated by beach grass, or otherwise lack vegetation.

Target Rock headlands
R. Parris/USFWS

Several hundred feet of the refuge beach is closed from early spring through late summer, to protect nesting bank swallows and belted kingfishers, provide undisturbed piping plover habitat, and also provide a beach free of disturbance for terns, shorebirds and other wildlife.

Fish and Wildlife

More than 200 avian species have been documented at Target Rock, of which more than 50 have been recorded as breeders. The refuge offers suitable habitats for many forest-, wetland-, and beach-dependent species, and provides an important stopover for many migrants. A variety of marine wildlife use the waters adjacent to Target Rock. Harbor seals use the coastline for feeding and loafing, as do leatherback and Kemp's ridley sea turtles. The shoreline supports a marine rocky intertidal community.

The chestnut oak/mountain laurel association and oak hardwood forest offer good food and cover for Neotropical songbirds, which are common during spring migration. Waterfowl, shorebirds, and waterbirds are common on the beach and off-shore. The headlands provide nesting habitat for belted kingfishers and bank swallows. Piping plovers use the refuge beach for foraging, and nest on adjacent lands.

Birds

Raptors

The raptors most commonly observed at Target Rock include the great horned and eastern screech owls, ospreys, American kestrels, merlins, and sharp-shinned, Cooper's, and red-tailed hawks. Screech owls abound on the refuge, and are easily detected.

Waterfowl

Waterfowl use the brackish pond and the rocky shoreline. Their numbers usually peak in winter, from October through March. Puddle ducks compose about one-fourth of the ducks using the refuge, and black ducks are by far the dominant puddle duck. The most common diving ducks include the common goldeneye, greater scaup, long-tailed duck, bufflehead, and red-breasted merganser. Harlequin ducks are occasionally observed near the historical Target Rock in Huntington Bay.

Shorebirds, Gulls, Terns and Allied Species

Common loons, red-throated loons, great cormorants, and horned grebes are common off the refuge beach in winter. In summer, double-crested cormorants are easily observed. Six species of long-

legged waders are commonly documented on the refuge, mostly in its brackish pond habitat.

Numerous sandpipers also make use of the rocky beach and brackish pond. The most common shorebird species include greater yellowlegs, black-bellied plovers, semi-palmated plovers, spotted sandpipers, and willets. Common and least terns are observed on the refuge from May through September.

Other Migratory Birds

Thirty-five Neotropical bird species have been documented at Target Rock. The sand bluffs above the refuge beach provide a specialized nesting habitat for several avian species. In 2001, approximately 10 pairs of bank swallows nested, as did belted kingfisher and northern rough-winged swallows. Closing a portion of the refuge beach appears to benefit these bluff-nesting species.

Mammals

The species most commonly observed on the refuge include the red fox, gray squirrel, eastern chipmunk, and eastern cottontail. Whitetailed deer, presumably absent since the 1950s, have again been sighted in recent years.

Marine Mammals

Harbor seals are observed periodically either swimming or hauled out on some of the rocks off the refuge beach. In the last two weeks of September 2001, that use was greatest when a harbor seal spent most of its time either hauled out on the beach or swimming parallel to it.

Rare, Threatened or Endangered Species

Piping plovers forage on the refuge beach and nest on the beach approximately a quarter-mile away from the refuge. State-listed least and common terns also forage along the refuge shore. Colonies of those terns as well as piping plovers nest directly across from the refuge at Eaton's Neck in Northport and at Caumsett State Park in Lloyd Harbor.

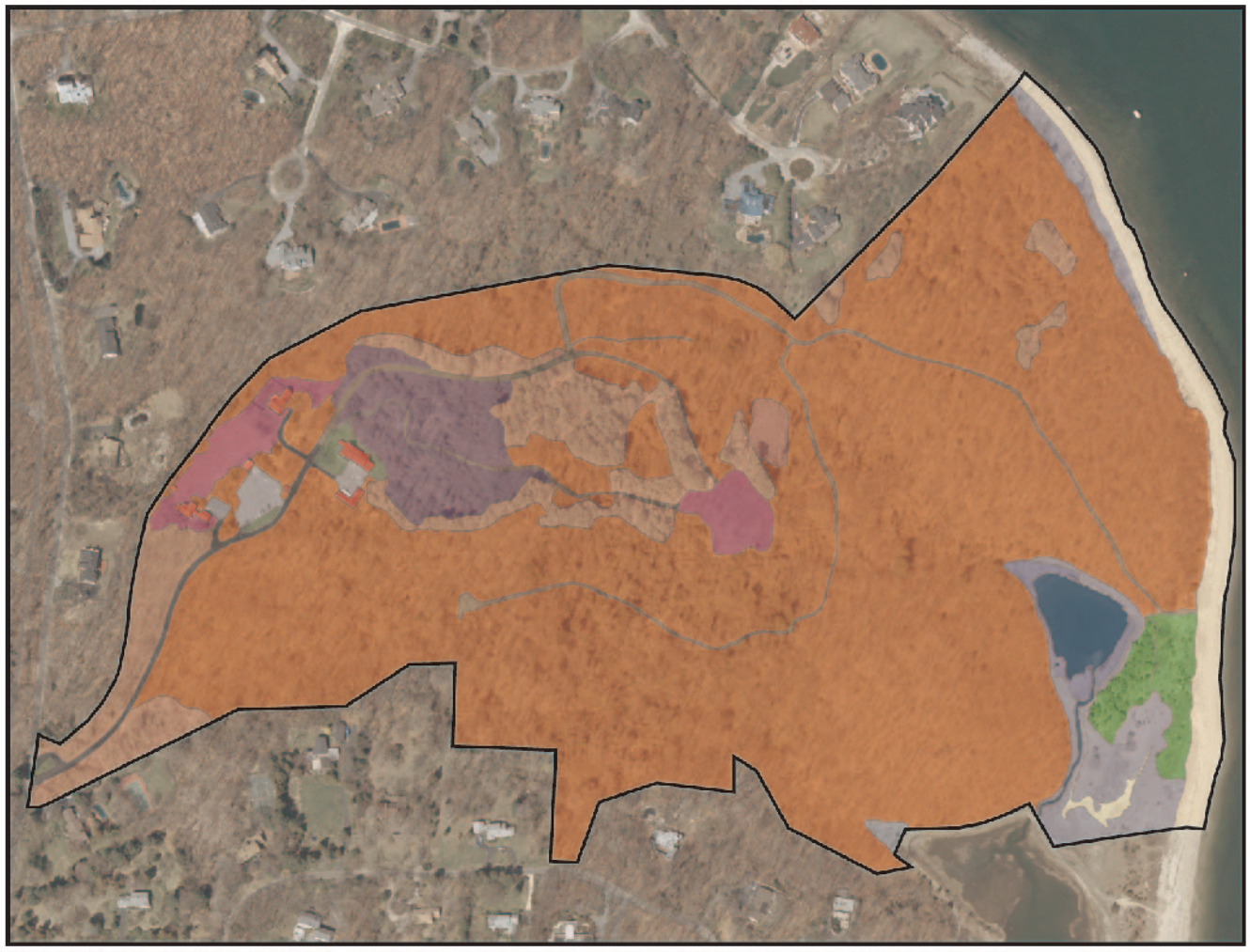
U.S. Fish & Wildlife Service

Target Rock National Wildlife Refuge

Suffolk County, New York

Map 3-11

Vegetation Cover Map



- Refuge Boundary (80 Acres)
- Building
- Paved Road
- Paved Parking Lot
- Gravel Path
- Rocky Beach
- Sand
- Water

Vegetation Cover

- Turf Grass
- Blackberry - Greenbrier Successional Shrubland Thicket *Rubus (argutus, trivialis) - Smilax (glauca, rotundifolia)* Shrubland
- Coastal Oak - Beech Forest *Fagus grandifolia - Quercus alba - Quercus rubra* Forest
- Coastal White pine - Oak Forest *Pinus strobus - Quercus alba / Ilex glabra* Forest
- Maritime Red-cedar Woodland *Juniperus virginiana / Morella (=Myrica) pensylvanica* Woodland
- North Atlantic Low Salt Marsh *Spartina alterniflora / (Ascophyllum nodosum)* Acadian/Virginian Zone Herbaceous Vegetation
- Northeastern Dry Oak - Hickory Forest *Quercus (alba, rubra, velutina) / Cornus florida / Viburnum acerifolium* Forest
- *Phragmites australis* Tidal Herbaceous Vegetation
- Red Maple / Tussock Sedge Wooded Marsh *Acer rubrum / Carex stricta Onoclea sensibilis* Woodland
- Salt Shrub *Baccharis halimifolia - Iva frutescens / Spartina patens* Shrubland
- Successional Broomsedge Vegetation *Andropogon virginicus var. virginicus* Herbaceous Vegetation

1:4,912

0 0.1 0.2 Miles

0 0.1 0.2 0.3 Kilometers

N W E S

Produced by Long Island NWR Complex, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

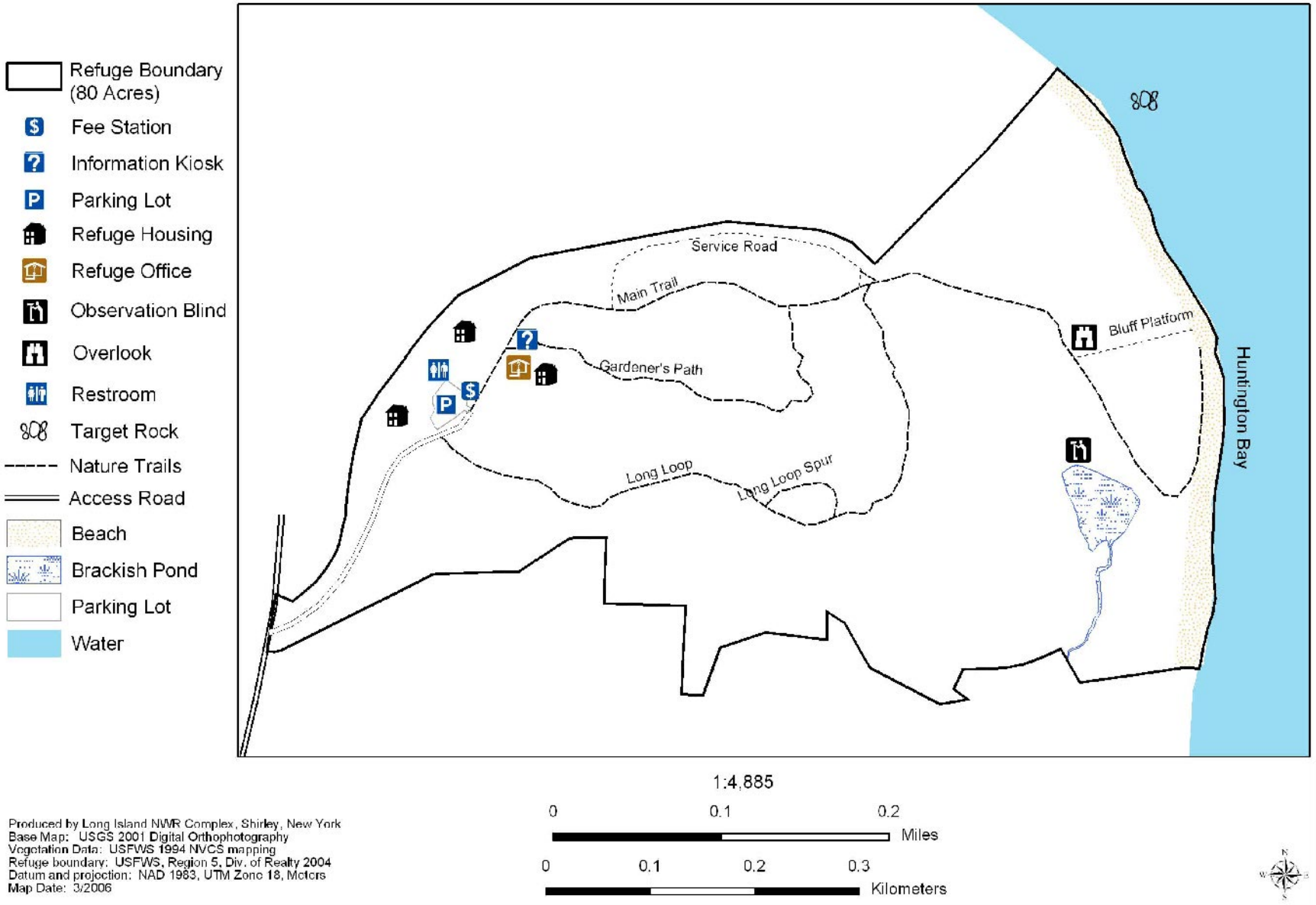
U.S. Fish & Wildlife Service

Map 3-12

Target Rock National Wildlife Refuge

Suffolk County, New York

Facilities and Trails Map



Produced by Long Island NWR Complex, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

Wertheim National Wildlife Refuge

Wertheim is the second-largest refuge in the Complex, at 2,572 acres. The acreage of its terrestrial and aquatic habitats is about equal. The terrestrial habitats are principally pine barren types; the aquatic habitats include both tidal and non-tidal surface types. Tidal waters include bays, ponds, streams, and freshwater, brackish, and salt marshes. Non-tidal waters include marshes, ponds, streams, and swamps. See maps 3-13 through 3-15 on the following pages.

Terrestrial Habitats

Forests compose more than 90 percent of Wertheim's uplands. The most common forest types include conifer plantations, mixed oak, oak/pitch pine, pioneer hardwood, pitch pine, red cedar, and red maple. The refuge is located on the periphery of pine barrens, an uncommon forest type in the state. Figure 3.1 shows the proportion of terrestrial habitats at Wertheim.

Forested wetlands are dispersed among the upland woods and along the four tributaries of the Carmans River. Shrub wetlands, forested flood plains, and a small number of emergent wetland fringes bound those creeks. Forested wetlands also occur along the upland forest and salt marsh edge. On the eastern portion of the Carmans River, where the proposed headquarters and visitor center would be located, the site best fits the description of a maritime oak forest by Reschke (1990), grading into a red maple swamp in the westernmost portions adjacent to the river.

The overstory of that site is a closed-canopy (at least 75 percent canopy cover), small, sawtimber-sized stand in second growth forest. The dominant tree species are red oak, black oak, and white oak with subdominant black cherry and white oak. Scattered pitch pines are present but uncommon. In the western portion of the proposed site, closest to the Carmans River, soils are wetter and pole-sized red maple dominates the overstory.

The understory in the site is moderately dense (over 50% ground cover) with most shrubs being less than 1 m tall. Dominant species were high bush blueberry, black huckleberry, low bush blueberry, black cherry, common greenbrier, and dewberry. Other species that are present include Virginia creeper, white oak, sassafras, arrow-wood, poison ivy, and currant. In the wetter soils closer to the river sweet pepperbush is a dominant species.

Grassland and forest openings are permanent herbaceous openings like forest meadows or fields. Twenty-four openings contain approximately twenty acres of grassland developed or maintained as warm or cold season grassland. Herbaceous openings help maintain the diversity of upland habitats at Wertheim.

Wildlife consistently use these forest openings. They provide brood habitat for wild turkeys and other gallinaceous birds, herbaceous forage for grazers, and nesting habitat for eastern bluebirds and some species of waterfowl. Their use by white-tailed deer and bob-white quail is high, particularly where legumes dominate. American woodcocks commonly use 13 of the forested fields as their spring singing and roosting grounds. In June and early July, eastern box turtles extensively use the forest openings. Sharp-shinned hawks and Cooper's hawks can frequently be observed during their spring and autumn passages.

Mixed oak forests occur on more than 600 acres at Wertheim. Canopy dominants include black, white, and red oaks - all three of which exist in most stands along with hickory. Several blueberry species and black huckleberry make up the understory of a mixed oak forest, although green briar and black cherry are also common.

Oak/pitch pine forests are an intermediate between the previous two types and have understories similar to the mixed oak type.

Pitch pine forests occur on 150 acres and are principally located on sandy soil types. Mature pitch pine stands exhibit the sparsest woody understory of any forest type at Wertheim.

Red maple forests occur on more than 200 acres and are mainly associated with wetlands. Dominants include red maple and tupelo. Red maple forests have the most robust understory of all the other forest types.

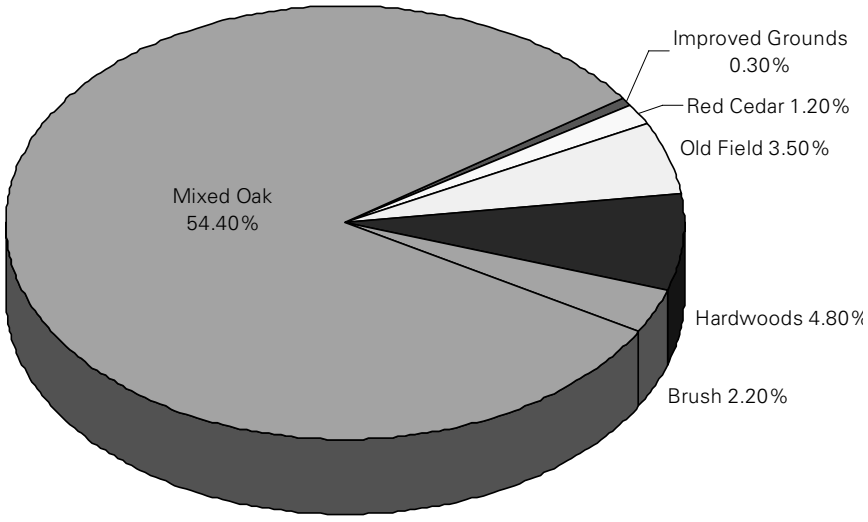


Figure 3.1. Terrestrial habitats at Wertheim

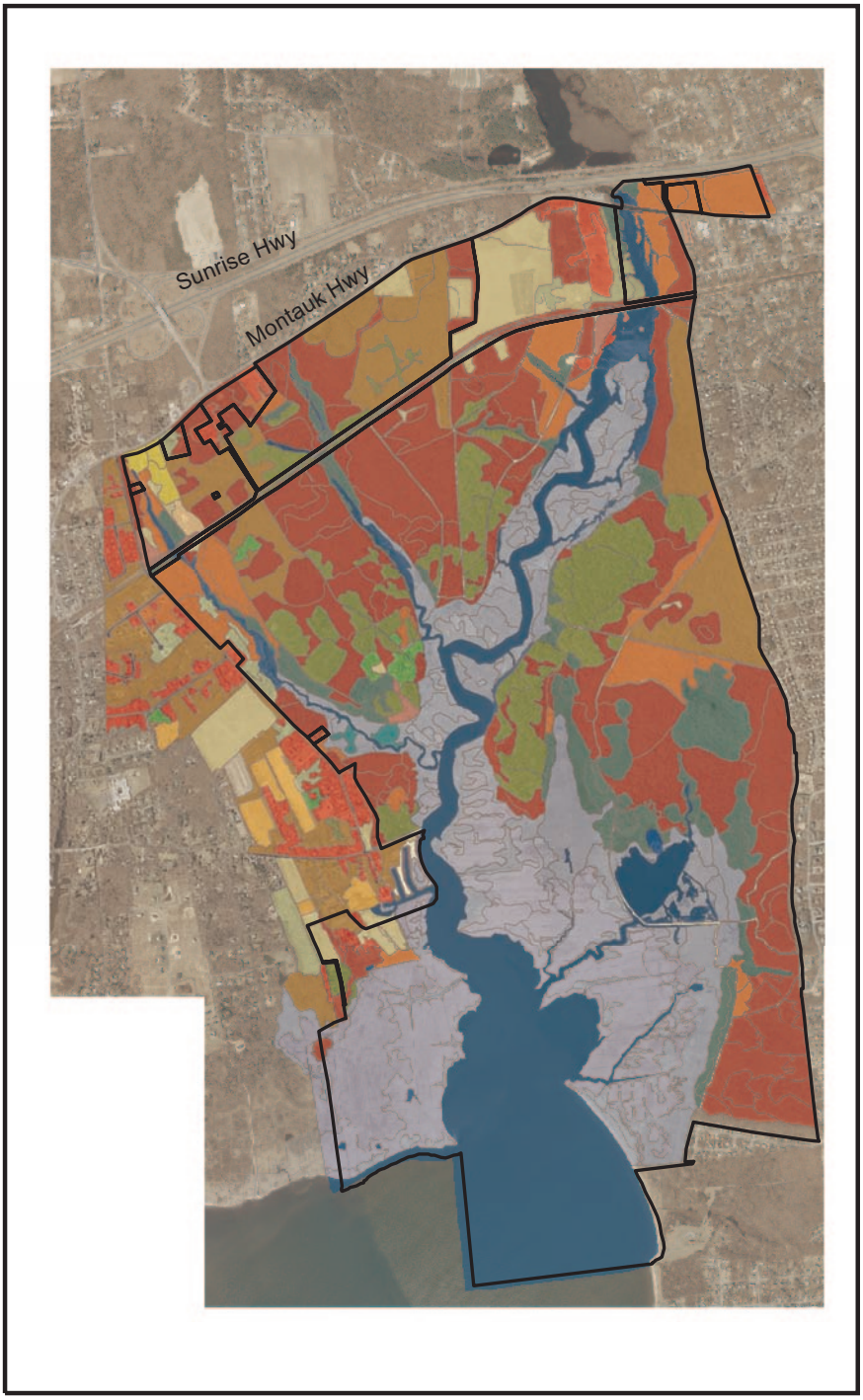
U.S. Fish & Wildlife Service

Map 3-13

Wertheim National Wildlife Refuge

Suffolk County, New York

Vegetation Cover Map



- Refuge Boundary (2,572 Acres)
- Water
- Marina
- Residential, Urban, Developed
- Inland Pool
- Paved Road
- Railroad
- Sand/Dirt Road

Vegetation Cover

- Row Crop
- Old Field
- Mature Old Field
- Old Field/Autumn Olive
- *Prunus serotina-Amelanchier canadensis-Fagus grandifolia-Quercus spp.* forest alliance
- *Smilax glauca - Toxicodendron radicans* vine- shrubland
- *Typha angustifolia - Hibiscus moscheutos* Herbaceous Vegetation
- *Phragmites Australis* Tidal Herbaceous Alliance
- *Spartina patens- Distichilis spicata - Plantago maritima* herbaceous vegetation
- *Juniperus virginiania-Myrica pennsylvanicum* woodland (Trees generally less than 4m)
- *Quercus Velutina - Quercus Alba - (Quercus Coccinea)* Forest Alliance
- *Quercus (alba, rubra, velutina) / Cornus florida / Viburnum acerifolium* Forest
- *Quercus coccinea - Quercus velutina / Sassafras albidum / Vaccinium pallidum* Forest
- *Pinus rigida - Quercus coccinea / Vaccinium pallidum - (Myrica pensylvanica)* Forest
- *Acer Rubrum - Nyssa Sylvatica Saturates* Forest Alliance

Produced by Long Island NWR Complex, Shirley, New York
Base Map: USGS 2001 Digital Orthophotography
Vegetation Data: USFWS 1994 NVCS mapping
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

1:31,587

0 0.5 1 Miles

0 0.5 1 1.5 Kilometers

N W E S

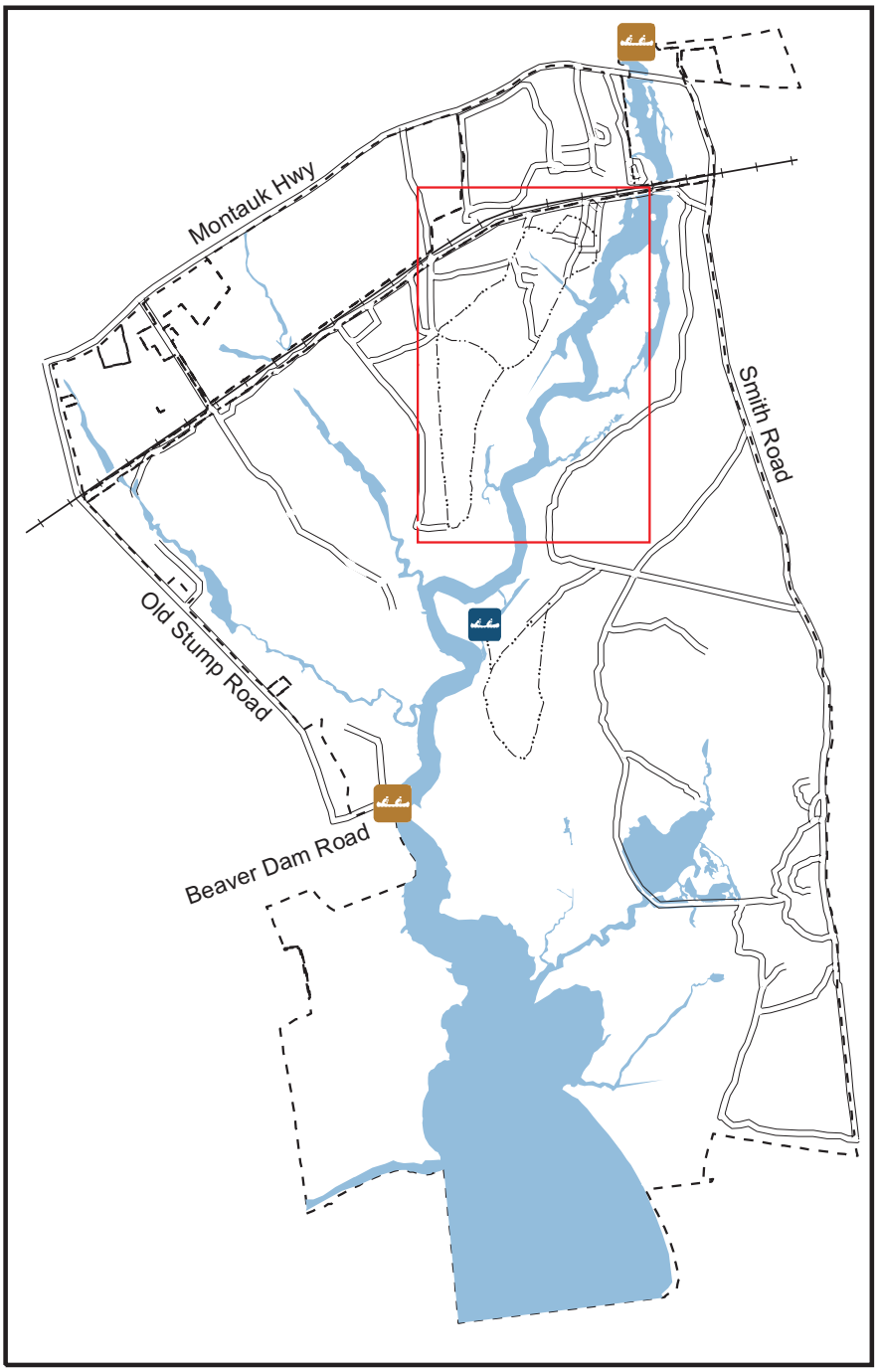
U.S. Fish & Wildlife Service

Map 3-14

Wertheim National Wildlife Refuge

Suffolk County, New York

Boat Launch and Fishing Access Sites



Refuge Boundary (2,572 Acres)

See Map 3-15

Nature Trails

Access Road

Railroad

Water

Trail Access via Canoe/Kayak

Shore Fishing Access, Canoe/Kayak Launch

1:28,047

0 0.5 1 1.5 Miles

0 0.5 1 1.5 2 2.5 Kilometers

N W E S

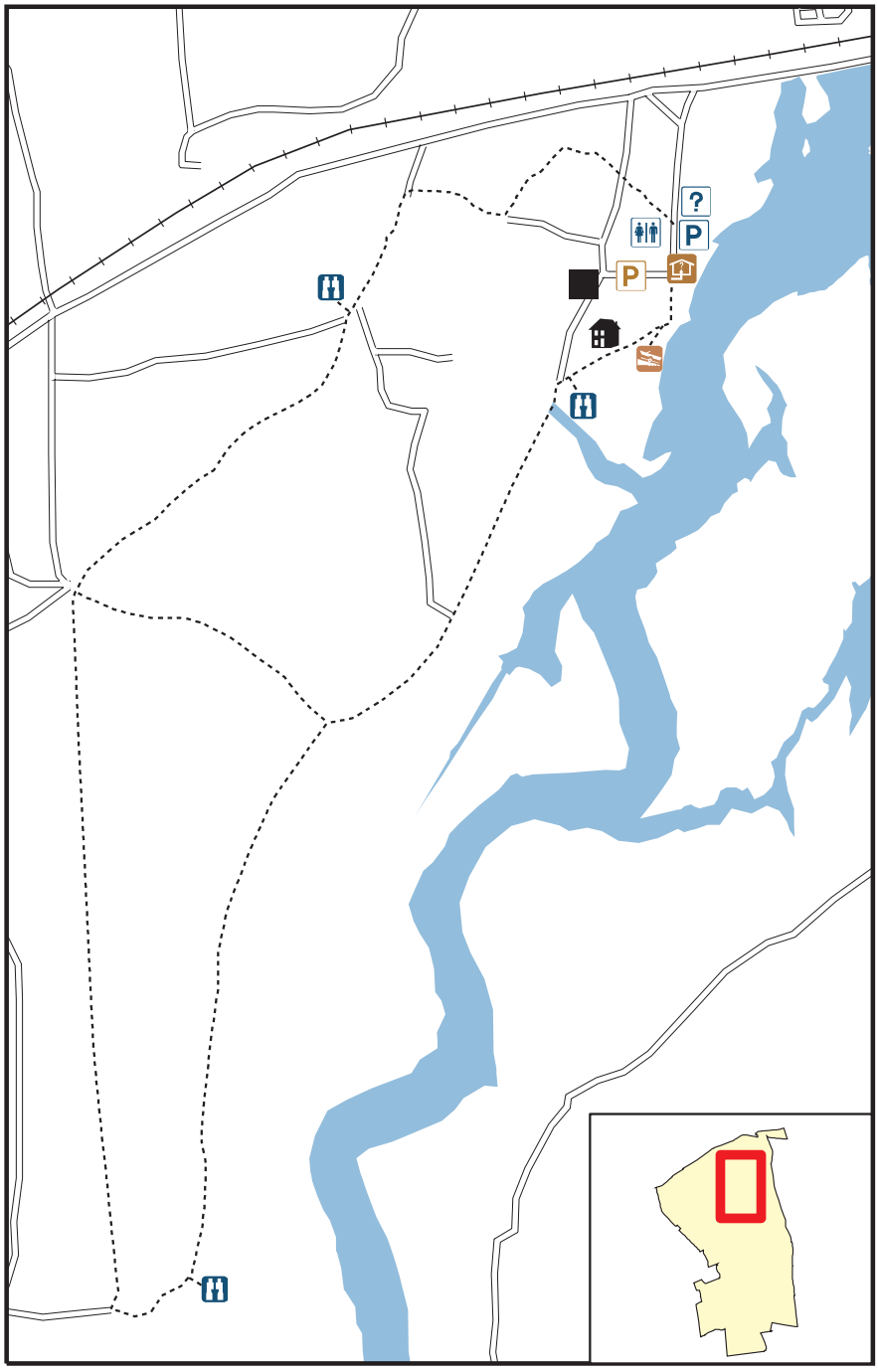
Produced by Long Island NWR Complex, Shirley, New York
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

U.S. Fish & Wildlife Service

Map 3-15

Wertheim National Wildlife Refuge
Suffolk County, New York

Facilities and Trails Map



- Information Kiosk
- Visitor Parking Lot
- Employee Parking Lot
- Observation Blinds and Platforms
- Maintenance Facilities (3) and Storage Buildings (2)
- Refuge Housing
- Headquarters and Refuge Offices (2)
- Restroom
- Employee Dock (No Public Access)
- Access Road
- Railroad
- Nature Trails
- Carmans River

1:7,500

0 0.1 0.2 0.3 Miles

0 0.2 0.4 0.6 Kilometers

N W E S

Produced by Long Island NWR Complex, Shirley, New York
Refuge boundary: USFWS, Region 5, Div. of Realty 2004
Datum and projection: NAD 1983, UTM Zone 18, Meters
Map Date: 3/2006

Wetland Habitats

Several large salt marshes covering several hundred acres border the Carmans River and its tributaries. Approximately 40 percent of the aquatic habitats at Wertheim consist of salt marsh and marine waters situated principally along the lower Carmans River and Bellport Bay. Another 40 percent consists of freshwater and brackish rivers, streams and marshes. Swamps and shrub swamps make up the remaining 20 percent.

The refuge maintains some of its salt marshes as open marsh water management areas. Wertheim has more than thirty miles of drainage ditches put in by Suffolk County Vector Control in the 1950's as a mosquito control measure. These ditches, located in salt and brackish marshes, destroyed pannes and backwater habitats. By plugging these ditches, the refuge has restored pannes habitats and salt marsh hydrology, and thereby provided excellent habitat for fish and wildlife.

Wertheim has five impoundments each with some degree of water level control: Big Fish Creek Impoundment, sub-impoundment, Pine Pond, Little Neck Run Pond and Owl Pond. Four of those are fewer than 10 acres, and three have fixed pipes that maintain a constant water level except during certain periods in summer. Big Fish Creek impoundment and the sub-impoundment have water control structures with flash boards.

The 40 acre Big Fish Creek Impoundment is centrally located on the refuge. Half of the impoundment consists of open water with associated submerged aquatic vegetation, and the other half consists of robust emergents. The 7 acre sub-impoundment constructed adjacent to it in 1989 is 33 percent forested wetland, 34 percent shrub swamp, 21 percent robust emergent divided between cattail and great reed, and 12 percent open water.

Aquatic Habitats

Wertheim is bisected by the Carmans River, a state-designated Wild and Scenic River. It is the second-longest brackish river on the island, and the focal point of the refuge. Approximately 3 miles of the river and the complex of salt marshes adjacent to it is located in the refuge. Yaphank Creek, Little Neck Run, Big Fish Creek and Little Fish Creek all join the Carmans River within Wertheim boundaries, and are described as freshwater tidal tributaries. The river and stream banks are heavily covered with *Phragmites*. The refuge aquatic habitats include a marine bay, tidal river, freshwater streams, ponds, salt marsh, brackish and freshwater marsh, red maple swamps and shrub swamps. The refuge protects one of the last undeveloped estuary systems remaining on Long Island.

Carmans River at Wertheirm.
USFWS

Fish and Wildlife

Wertheim hosts nearly 500 vertebrate species and roughly 500 species of vascular plants. The refuge encompasses many of the vegetation types on Long Island, thereby providing habitat for a variety of wildlife ranging from forest interior nesting, Neotropical migrant birds to marine mammals. The coastal location of the refuge also makes it part of a major migration corridor for a variety of birds including waterfowl, waterbirds, raptors, and songbirds. Avian species are the largest single class of vertebrates at the Complex, with more than 200 bird species having been documented at Wertheim.

Birds

Raptors

The coastal location of the refuge makes it an important migratory area for certain raptor species, in particular the northern harrier, osprey, peregrine falcon, sharp shinned hawk, Cooper's hawk, kestrel, merlin, saw whet owl, and short eared owl. Common nesting raptors include osprey, northern harrier, red-tailed hawk, great horned owl, and screech owl. Bald eagles are observed during fall migration, and immature eagles over-wintered at the refuge in 2003 and 2004.

Waterfowl

Waterfowl use is extensive and the refuge serves as important wintering habitat for waterfowl between October and March. Principal species include black duck, greater scaup, bufflehead, gadwall, and red-breasted merganser. Green-winged teal are abundant during migration. Wood ducks are prolific nesters, while each year, black ducks and mallards rear several broods, as well.

Waterbirds, Shorebirds, Gulls, Terns and Allied Species

Waterbird use is common with peak periods for long-legged wading birds, terns, shorebirds and other waterbirds occurring in the warmer months. Nine species of herons, egrets and ibises are commonly observed on the refuge. Great blue herons, snowy egrets, green-backed herons, and great egrets are most common, with great blue herons present year-round. The number of long-legged wading birds peaks in August and there is a smaller peak earlier in April. American bitterns, a state-listed species of special concern, are present in the winter.

Herring, great black-backed, laughing, and ring billed gulls are commonly observed at the refuge. Herring gulls are the most common, and are present year-round. Great black-backed gulls are the next most common species.

Other marsh and waterbird species observed on the refuge include the double-crested cormorant, common loon, pied-billed grebe, sora, and belted kingfisher.

Least and common terns are observed on the refuge from May through August. Other shorebirds observed include greater yellowlegs, least sandpiper, black-bellied plover, killdeer, spotted sandpiper, short-billed dowitcher, semi-palmated sandpiper, dunlin, and willet. Shorebird numbers peak in August, but high numbers are also present in the months of May, July, and September.

Other Migratory Birds

Songbirds are a conspicuous component at Wertheim and a major attraction for many of the visitors. The songbird community is diverse and includes many Neotropical migrant species. Dominant breeding songbirds of forested habitats include ovenbird, American redstart, yellowthroat, catbird, rufous-sided towhee, great crested flycatcher, eastern wood peewee, blue jay, Carolina wren, wood thrush, red-eyed vireo, pine warbler, northern oriole, northern mockingbird, and brown thrasher.

Dominant breeding songbirds of shrub and grassland habitats include the song sparrow, tree swallow, yellow warbler, mockingbird, barn swallow, house wren, northern cardinal, and American goldfinch. Breeding birds of tidal wetlands are dominated by the sharp-tailed sparrow, marsh wren, song sparrow, seaside sparrow, red winged blackbird, and the tree swallow. The refuge also provides important stopover habitat during migration for many species using the coastal migration corridor. Prominent winter songbirds at the refuge include the white throated sparrow, dark eyed junco, black capped chickadee, white breasted nuthatch, tufted titmouse, northern cardinal, and blue jay. Purple finch, evening grosbeak, red crossbill, and pine siskin use the refuge extensively in periodic hard winters.

Red-winged blackbird
John Mosesso, Jr./NBII

Reptiles and Amphibians

Approximately 30 species of reptiles and amphibians occur at the refuge. Dominant freshwater reptiles include the eastern snapping turtle, eastern painted turtle, spotted turtle, and the northern watersnake. The dominant reptile of tidal habitats is the diamond-

back terrapin. Eastern box turtle, black racer, eastern milk snake, eastern ribbon snake, and the common garter snake are the dominant reptile species of terrestrial habitats. Eastern box turtles and eastern hognose snakes are of interest because of the perceived current decline of these species on Long Island where both were once considered abundant and dominant species.

Common amphibians include red-backed salamander, bullfrog, green frog, wood frog, Fowlers toad, and spring peeper.

Mammals

Approximately 30 species of mammals have been documented at the refuge. White-tailed deer, eastern cottontail, gray squirrel, red fox, eastern chipmunk, and muskrat are commonly observed. Harbor seals are the most common marine mammal, although irregular in occurrence at the refuge. Bats compose about a quarter of the mammalian species and the little brown bat, big brown bat, eastern pipistrelle, and the red bat are the most common.

Fish

The refuge possesses a diversity of aquatic habitats ranging from marine to freshwater and tidal to non-tidal as well as stream and pond habitats. The fish community reflects this diversity of habitats. Salt marshes support an interesting array of killifish species, bays provide seasonal habitat for many important commercial marine species, tidal rivers and streams support both catadromous and anadromous species, freshwater streams serve as trout habitat, and ponds and impoundments support warm water fisheries. Dominant species include American eel, Atlantic silversides, summer flounder, pumpkinseed, blueback herring, alewife, banded killifish, sheepshead minnow, striped bass, winter flounder, and bluefish. The presence of sea-run or "salter" brook trout in Yaphank Creek is a unique occurrence on Long Island.

Rare, Threatened or Endangered Species

Federally designated endangered or threatened species occur at Wertheim intermittently, but do not use the refuge in the breeding season. They include roseate tern, bald eagle, and the loggerhead sea turtle. State-listed endangered or threatened species at Wertheim—not already listed by federal authorities—include golden eagle, peregrine falcon, black rail, and king rail; black, common, and least tern; and short-eared owl, loggerhead shrike, pied-billed grebe, least bittern, northern harrier, upland sandpiper, sedge wren, and eastern mud turtle (USFWS 1995, NYSDEC 2003).

The tiger salamander, northern cricket frog, Hessel's hairstreak, and frosted elfin are state-listed threatened and endangered species whose presence at Wertheim is likely, but unconfirmed (USFWS 1995).

Page 3-14 details some of the habitat preferences of the species listed above. Table 3.3 lists species of special concern at Wertheim. Refer to appendix A for a complete species list.

Table 3.3. Species of Special Concern at Wertheim

common loon	(*Gavia immer*)
American bittern	*(Botaurus lentiginosus)*
osprey	*(Pandion haliaetus)*
sharp-shinned hawk	*(Accipiter striatus)*
Cooper's hawk	*(Accipiter cooperii)*
northern goshawk	*(Accipiter gentilis)*
red-shouldered hawk	*(Buteo lineatus)*
black skimmer	*(Rynchops niger)*
common nighthawk	*(Chordeiles minor)*
whip-poor-will	*(Caprimulgus vociferous)*
red-headed woodpecker	*(Melanerpes erythrocephalus)*
horned lark	*(Eremophila alpestris)*
golden-winged warbler	*(Vermivora chrysoptera)*
cerulean warbler	*(Dendroica cerulea)*
yellow-breasted chat	*(Icteria virens)*
grasshopper sparrow	*(Ammodramus savannarum)*
seaside sparrow	*(Ammospiza maritima)*
vesper sparrow	*(Pooecetes gramineus)*
spotted turtle	*(Clemmys guttata)*
eastern box turtle	*(Terrapene carolina)*
worm snake	*(Carphophis amoenus)*
eastern hognose snake	*(Heterodon platyrhinos)*
eastern spadefoot toad	*(Scaphiopus holbrooki)*
southern leopard frog	*(Rana sphenocephala)*

History and Cultural Resources

Early History

The Unkechaug Indians were one of the 13 tribes making up the Long Island confederacy. They had a population of 6,500 at the time of the first white settlement in 1635. The Unkechaugs, Poosepatucks, Shinnecock, and Montauk tribes continued to live in communities that in time became reservations (Borg and Shreeve 1974).

The first white settlers came to Suffolk County, Long Island in 1635. They were of English origin and crossed Long Island Sound from colonies in Massachusetts and Connecticut. Early occupations included whaling, grist and saw milling, fulling, ice harvesting, salt haying, duck hunting, and fishing (Borg and Shreeve 1974).

The whaling industry began in 1667 when settlers agreed to pay the Unkechaugs for every whale they delivered. The Carmans River was important for shore-based whaling crews as well as small coastal trading vessels.

Recent History

By the 1940s, villages and hamlets dominated Nassau and Suffolk Counties and aviation and agriculture prevailed as industries. In the 1950s and '60s people moved their families to Long Island and transformed the villages and hamlets into suburban sprawl. Over the past 50 years, the population of Nassau and Suffolk Counties more than tripled to 2.6 million.

It is interesting to note that adjacent to Oyster Bay National Wildlife Refuge is the Sagamore Hill National Historic Site, operated by the National Park Service. With over 40,000 visitors per year, Sagamore Hill is an 83-acre site that was the home of Theodore Roosevelt, 26th President of the United States, from 1885 until his death in 1919. From 1902 to 1908 his "Summer White House" was the focus of international attention. Theodore Roosevelt is also credited as the founder of the National Wildlife Refuge System when he designated Florida's Pelican Island as the first refuge in 1903.

Archaeology and Historic Structures

The USFWS Region 5 archeologists have conducted several small surveys at the Complex, but no comprehensive survey has been done of the Complex's individual refuges. One structure, the L-Shaped Barn, at Seatuck has been designated as historic on the National Register of Historic Places. No other structures at the Complex have been listed on the Register. The Complex does possess several small historic cemeteries which are protected from disturbance.

Museum Property

The Department of the Interior identifies several major categories of museum property: archaeological collections, ethnographic materials, art, documents which are not official records as defined by the National Archives, historical objects related to the Service, environmental samples, and botanical, geological, zoological, and paleontological collections (USFWS 1997). A Museum Property Survey identified five items of museum property at the Complex: one historical object each at Morton and Seatuck, and three zoological items at Wertheim.

Socioeconomic Environment

Refuge Contributions to the Local Economy

Refuge Revenue Sharing

The Complex contributes directly to its local economy through revenue sharing payments. The Federal Government does not pay property tax on refuge lands, but instead, pays refuge revenue sharing to local taxing authorities based on a maximum of three-quarters of 1 percent of the fair market value of refuge land, which is determined by an appraisal every 5 years. The actual amount distributed each year varies by the amount of congressional appropriations. Please refer to appendix B for more information. That amount also changes as we acquire new lands. Table 3.4 shows the amounts the Complex contributed to Nassau and Suffolk counties between fiscal years 2000 and 2004.

Table 3.4. Refuge revenue sharing payments from the Complex to Nassau and Suffolk counties.

Year	Total Paid to Nassau County*	Total Paid to Suffolk County**
2000	$1,222	$184,637
2001	$1,247	$287,816
2002	$993	$256,539
2003	$1,120	$287,386
2004	$990	$255,831

*Includes Oyster Bay refuge.
**Includes Amagansett, Conscience Point, Morton, Seatuck, Target Rock, and Wertheim refuges.

Public Use

The public use program at the Complex focuses on wildlife-dependent recreation, including environmental education, nature interpretation, wildlife observation, photography, and fishing. Public relations and outreach are also a significant part of our public use program.

Map 2-1 on page 2-14 in chapter 2 features public use opportunities available at each refuge. Additional maps in this chapter show the locations of facilities and nature trails available at refuges that are open to public use.

Environmental Education

Suffolk and Nassau counties contain 129 public school districts with roughly 30,000 teachers and about 390,000 students. We estimate an average of 5,000 students visit Wertheim, Target Rock, and Morton each year. Approximately 3,000 students canoe the Carmans River at Wertheim each year. The potential is tremendous for increasing the number of environmental education users. School and scout groups account for 90 percent of the requests for refuge-staff-guided programs.

Teachers use Morton, Target Rock and Wertheim refuges, and historically used Lido Beach, where teacher workshops and school programs frequently were conducted by the Sealink Environmental Center, Long Beach School District. The potential for rekindling interest in Lido Beach is great, and that goal is attainable.

In the past, our outdoor recreation planner worked closely with local school teachers in teacher workshops and by individual appointment to empower teachers to guide their own class trips on the refuges open for environmental education. A teaching-about-wetlands workshop developed for Wertheim was well received by teachers and scout leaders, and served as a test case for developing similar workshops at other refuges in the Complex. Local teachers are now testing similar packets drafted for teacher-guided environmental education programs. The outdoor recreation planner position is currently vacant.

Environmental education activity at Wertheim.
B. Stewart/USFWS

The Friends of the Bay and The Waterfront Center are promoting marine environmental education programs for schools as well as for the public in the Oyster Bay area. The Complex has been invited to participate in teacher workshops, guided programs, exhibits about Oyster Bay, and literature. Our staff continues to work with those partners to promote stewardship and appreciation for Oyster Bay.

Interpretation

Fourteen million people live within a 2-hour drive of the Long Island refuges. Even with little media coverage, the Complex still receives nearly 500,000 visitors per year. Staff-guided interpretation programs are given on request, when time permits. Wertheim, Target Rock, and Morton now offer self-guided trails. In 2001, much work was done to improve interpretation on the Complex, and continues today. Three new brochures became available to the public in 2001: bird, mammal, and general. A reptile and amphibian brochure, a Target Rock trail guide, and a Morton trail brochure were developed in 2003. Our staff directed much of its energy toward Target Rock, improving its trail surface for safety and ease of walking, relocating the trail head and developing a new trail guide, updating the information kiosk with new interpretive signs, and adding an overlook where visitors can stop to view Huntington Bay.

Refuge staff also improved the Wertheim trail, resurfacing it and making a 1-mile portion barrier-free, and adding SoundPost panels that give audio information at the touch of a button. New interpretive signs also update the information kiosk, and the new trail guide is an effective tool for the public and educators.

Similarly, trail work at Morton involved renewing the surface and creating a barrier-free section leading to the refuge beach and ending in a deck or observation platform. A new trail guide and updated interpretive signs accompany our plans now underway to create a demonstration garden of native plant species.

Maintence of a nature trail
R. Parris/USFWS

The Complex lacks a visitor center. However, a visitor center has been proposed and was evaluated as recently as 2001. We continue to plan for the development and completion of a visitor center with refuge headquarters. See chapter 2, alternative B for details.

Wildlife Observation and Photography

Visitors enjoy observing wildlife by using the nature trails and beaches at Morton and Target Rock. Observation at Wertheim offers the use of nature trails, the refuge entrance road, and canoeing or kayaking the Carmans River. Observation and photography blinds help visitors get a better view and minimize the disturbance of wildlife. Wildlife photographers may obtain special use permits to photograph wildlife in closed areas on the refuges. Traditionally, permitted photographers have allowed the Complex to use their

images free of charge in its publications and audio/visual programs, and have become important partners.

Hunting and Fishing

Currently, public waterfowl hunting is not allowed on any of the Complex refuges. Biologists conducted an environmental assessment to investigate the possibility of hunting the overabundant white-tailed deer at Wertheim. That was approved, and began in the fall 2005.

Long Island holds the majority of New York's wintering waterfowl. Tens of thousands of ducks and geese of at least 28 species are available to Long Island's waterfowlers. The various seasons run from early September through early March. Most waterfowlers hunt on the tidal marshes, bays, and creeks along the shore. In years when the Atlantic Flyway Council approves the liberal alternative for New York, the state offers a long season of approximately 105 days, a 6-bird daily bag limit for most species, and a 7-bird daily limit to those hunting scoters, eiders and long-tailed ducks in Long Island Sound and the Peconic Bays. The seasons or limits are reduced when the council approves the moderate, restrictive, or very restrictive alternatives for the state.

Many duck hunters pursue the dabbler species, particularly black duck, with mallard, pintail, widgeon, gadwall and green-winged teal making up most of the harvest. Hunters that seek the diving duck species generally set for bluebills like the greater scaup, and typically encounter a variety of other open water species, including bufflehead, goldeneye and redhead. Canada geese and brant are popular in the western bays of the south shore.

Most tidal areas are publicly owned, and can be hunted without special permission; however, access is often difficult. The successful hunt generally requires a seaworthy grassboat well-camouflaged with salt hay, or a scooter painted to resemble waves or ice for open bay bluebill rigs. For the hunter willing to scout, some good freshwater shooting for puddle ducks can still be found in eastern Suffolk County. The eastern portion of the county also provides excellent goose-shooting from leased lands or guided blinds. Regulations are subject to change, and hunters should consult the regulations for the current year for restrictions on certain species.

The Suffolk County Department of Parks, Recreation, and Conservation offers waterfowl and deer hunting programs in some of its parks. The county waterfowl program at South Haven County Park is especially geared toward the novice waterfowl hunter. The National Park Service permits waterfowl hunting from the Fire Island National Seashore.

Special access permits are required for all of these controlled hunting areas. Private lands are often posted; however, with some work, open areas can be found. In all cases, every hunter should obtain landowner permission before hunting on any area. As Long Island becomes increasingly developed, the resulting loss of habitat will continue to take its toll on wildlife and hunting opportunities.

Migratory game bird seasons are set based on five migratory game bird hunting zones that have been approved by the Service. All dates listed are tentative until we adopt the Final Federal Frameworks for migratory game bird hunting regulations in late summer. All New York waterfowl hunters are required to register for the Harvest Information Program. The HIP is a federally mandated program used solely to survey migratory game bird hunters.

Fishing is permitted on the Carmans River at Wertheim, from the beaches of Morton, Target Rock, and Amagansett, and at Oyster Bay. Table 3.5 lists information about fishing opportunities at the Complex. Fishing licenses are not required, because these waters are considered to be tidal waters. The exception is Mill Neck Pond at Oyster Bay, where a state fishing license is required. New York State regulations governing creel and size limit of fin fish and shellfish are in effect at all Complex refuges for species such as striped bass, fluke, flounder, weakfish, and other sport fish. Recreational and commercial trapping are not permitted on any of the refuges.

Table 3.5. Fishing information and opportunities at the Complex.

Refuge	*Anglers per Year	Nearest Highway	Comments	Available Fish Species
Amagansett	180	Montauk Hwy., 27A, 80	Shore access. Parking on town property only; a permit may be required.	Striped bass, weakfish, Atlantic mackerel, flounder.
Morton	50	Hwy. 27	Shore access. Trails and portions of beach closed April 1–mid-August.	Striped bass, weakfish, Atlantic mackerel, flounder, bluefish, tautog, ling, eel blowfish.
Oyster Bay	50,000	Long Island Expressway	Access from town launches or Long Island Sound.	Striped bass, weakfish, Atlantic mackerel, flounder, bluefish, spotted seatrout.
Target Rock	500	Hwy. 110	Shore access. Good access roads.	Striped bass, weakfish, blackfish, Atlantic mackerel, flounder.
Wertheim	2,500	Hwys. 27, 46, 80	**Riverbank and boat access.	Striped bass, weakfish, brown trout, brook trout, rainbow trout, carp, largemouth bass, white perch.

*Estimated average number of anglers per year.
**Canoe, kayak and shore access to the Carmans River available at the fishing access site on Montauk Hwy Rt.27A/ CR 80. Fishing from riverbank permitted year-round between the Sunrise and Montauk Highways, and Squassux Landing at the end of Beaver Dam Road in Brookhaven. Fishing from a boat is permitted anywhere except on Big Fish Creek Pond.

Public Relations

Each year, Long Island receives an estimated 26 million visits, and the Complex receives an estimated 500,000 visits. We issue 6 to 12 news releases annually to 25 local and regional newspapers, radio, and television media, and invite them to the refuges when newsworthy events occur. *News 12 Long Island* broadcasts from one to three stories about the Complex each year.

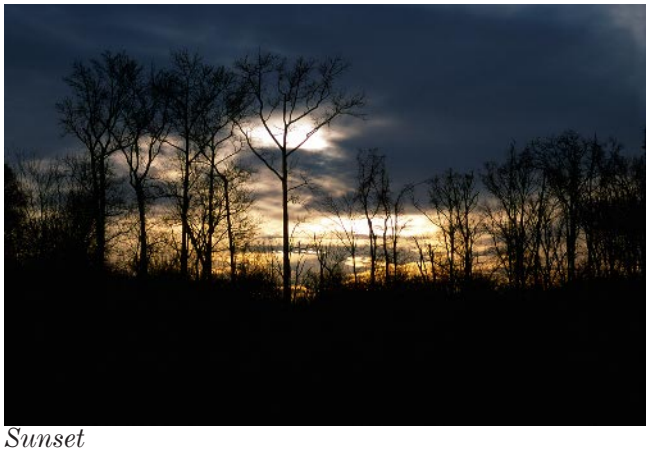
Complex staff will present onsite programs to organized groups at Wertheim, Morton, and Target Rock on request when staff time permits. Offsite programs are conducted in Suffolk and Nassau Counties in association with various government and non-government organizations. Most of those programs are family- or education-oriented.

The political climate is very dynamic in the heavily populated area around the Complex. The refuge manager and staff work diligently year-round to maintain open lines of communication with concerned citizens, local, state, and federal politicians. Our outreach includes meetings in person, conference calls, letters and publications, and attending special events.

Non-Wildlife-Dependent Recreation

Wertheim and Oyster Bay accommodate canoeing, kayaking, and row boating. Private boat rentals do business near both refuges. Approximately 9,000 canoeists visit the Carmans River each year. Boat rentals at Oyster Bay are assumed to number in the hundreds.

Many non-wildlife-oriented recreational uses are not permitted on national wildlife refuges. Activities generally not permitted or encouraged include camping, picnicking, swimming, using off-road vehicles, power boating, house boating, surfing, waterskiing, jogging, bicycling, horseback riding, and operating concessions. However, an occasional exception may be permitted.



Sunset
John Mosesso, Jr./NBII

Oyster Bay has boat moorings regulated by the Complex. The Complex also has the authority to regulate the Town of Brookhaven docks at Squassux Landing Marina on the Carmans River at Wertheim, where the docks extend into the refuge. The U.S. Coast Guard considers both areas navigable waters.

Socio-Political Climate

We based the following information on information obtained from the New York State Office of Parks and Recreation (2003). The type of recreational facilities provided by different types of operators or owners varies considerably. Those differences usually are based on geography, the activity, and the provider.

Federal

The role of the Federal Government in directly providing recreational resources in New York State is fairly limited; it provides less than 5 percent of the recreational acreage and less than 1 percent of the recreational sites. A major element of the federal recreation program is to assist localities through its various programs, rather than maintain and operate federal facilities. Nevertheless, the Federal Government does maintain recreation areas owned and managed by a number of different agencies: the National Park Service, U.S. Forest Service, U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service.

One of the most notable federal sites on Long Island is the Fire Island National Seashore, only 1 hour east of New York City. The opportunities it offers include 32 miles of sandy beaches, a "sunken" forest of 300-year-old holly trees, hiking trails, saltwater marshes, New York State's only federally designated wilderness, and one of the tallest lighthouses in the United States. Tours are also available in the home of William Floyd, one of Long Island's signers of the Declaration of Independence. State-, county- and town-owned public beaches on Fire Island provide additional opportunities for recreation. The Sailors Haven and Watch Hill units depend on water travel, and generally are open from mid-May through mid-October each year. The Fire Island Light Station, the William Floyd Estate and the Fire Island Wilderness Visitor Center at Smith Point are accessible year-round, but operating hours vary by season.

State

The State fulfills its role as a recreation provider in a number of ways. It coordinates with the Federal Government, maintains its own recreation facilities, and works with localities in providing recreational amenities. The two state agencies that provide the most significant recreational opportunities are the Office of Parks, Recreation and Historic Preservation and the Department of Environmental Conservation.

Local

Local government provides the greatest number of recreation sites but not the largest acreage. Together, county, town, village governments and school districts operate about 44 percent of the more than 14,000 recreation sites and about 7 percent of the recreational acreage in the state. The Suffolk County Parks Department manages more than 42,000 acres of parkland offering many leisure pursuits. The park system offers such popular activities as golfing, camping, horseback riding, swimming, hiking, fishing, boating, taking part in outer beach activities, or visiting local historic sites.

Local attitudes about the Complex vary, but most of the public is favorably disposed toward our mission of protecting and preserving wildlife and their habitats on Long Island. A sizeable segment of the public demonstrates their interest in protecting natural resources by visiting the refuges and other natural areas on Long Island. A vocal segment is also interested in limiting future development on the wildlands remaining on Long Island. Potentially controversial issues involve white-tailed deer, wildlife-dependent recreation, and mosquito control.

Weirthem has more than 30 miles of drainage ditches put in by the Suffolk County Vector Control during the 1950s as a mosquito control measure.
Suffolk County Vector Control

Refuge Complex Administration

Staffing and Budget

Highly variable annual budget appropriations commensurately affect our staffing levels. Table 3.6 summarizes our budget and staffing levels from 1997 to 2005. Fluctuations reflect funding for special projects, moving costs for new employees, or large equipment purchases. Most of the funding is earmarked; very little discretionary funding is available.

Table 3.6. Budget and Staffing Levels between 1997 and 2005

FY	Operations	Maintenance	Full time	Seasonal	Term
1997	$700,300	$197,500	10	2	0
1998	827,300	170,000	10	3	0
1999	770,800	101,900	12	1	0
2000	761,800	254,000	12	3	0
2001	838,900	303,000	13	2	0
2002	830,000	492,700	11	2	1
2003	1,044,287	557,249	12	0	0
2004	1,054,592	156,593	12	0	0
2005	944,125	248,820	12	0	0

Land Acquisition

Because of the limited number of undeveloped tracts in the vicinity of the refuges, we are not planning any major refuge expansions. Reduced land acquisition funding and escalating land prices have also made it difficult for the Service to undertake large preservation efforts, especially on Long Island. We will continue to consider minor acquisitions that lie next to existing refuges and are biologically important or provide connections with other lands protected by our conservation partners. We will deal with those situations as they arise.

Resource Protection and Visitor Safety

The nine refuges of the Complex are situated over approximately 100 miles of Long Island, stretching from Lido Beach easterly to Amagansett. The Complex headquarters at Wertheim is located in Suffolk County, which has a population of 1.5 million people and lies within a 1 hour commute of New York City. Target Rock, Wertheim, Oyster Bay, Amagansett, and Morton refuges are open to the public, and average approximately 500,000 visitors annually. Conscience Point, Seatuck, Sayville, and Lido Beach refuges are closed to public visitation, but are accessible by special use permit for research and environmental education. Target Rock and Morton refuges are also part of the Federal Fee Demonstration Program.

Since 1999, the Complex law enforcement staff has been limited. Before the station law enforcement program consisted of two collateral duty officers. As a result of the minimal number of officers and the long distances between refuges, many violations go undetected or unreported. In the past 7 years, the Complex averaged more than 500 reported incidents and 10 violation notices per year. Most of those typically involved trespassing, the illegal use of ATVs, unleashed dogs, dumping, or vandalism.

Because the Complex is close to densely populated areas, it is also susceptible to such criminal activities as burglary, prostitution, drug use, and violence. Numerous building break-ins resulted in the theft of government property or vandalism. The Suffolk County Police Department made three felony arrests for burglary or the illegal use of a rifle at the Complex, and investigated three violent crimes. Wildlife-related violations include poaching, wildland arson, and disturbance of plants or animals. Poaching is becoming an increasing problem on several refuges.

The law enforcement staff also supports the biological and public use programs. Their duties include enforcing laws, collecting and counting entrance fees, contacting visitors, participating in the prescribed fire program, participating in public events, and counting wildlife. A station-by-station overview of the Complex Law Enforcement Program follows.

Amagansett

As a result of its unique double dune system, most of the refuge is closed to the public except by special use permit. Fishing the Atlantic Ocean from shore, which is open to the public, does occur. Trespassing into the closed area and dumping along the perimeter are the main law enforcement problems.

Conscience Point

This 60-acre refuge is located 5 miles west of Morton, and is closed to the public except by special use permit. Enforcement issues consist mainly of trespassing e.g. from waterfowl hunters on properties adjacent to the refuge, with occasional reports of poaching white-tailed deer.

Elizabeth A. Morton

Morton refuge, located 40 miles east of the Complex headquarters, is open to the public year-round and is part of the Federal Fee Demonstration Program. Fee compliance checks are done throughout the year, particularly during periods of heavy public use. As a result of the legally protected nesting piping plovers, terns, and ospreys, and

the presence of other migrating shore birds, we close the peninsula to the public from April 1 to August 31. Trespassing by boaters is a continual problem in the summer. The vandalism of the refuge signs and building occasionally happens. The feeding of wildlife is becoming an increasing problem, as the wildlife lose their fear of humans, and as this activity has attracted Norway rats to the area.

Lido Beach

This wildlife management area comprises mainly tidal wetland. It is closed to the public except by special use permit. Most violations involve trespassing and dumping.

Oyster Bay

This refuge, located on the north shore of Long Island, consists of 3,204 acres of bay bottom and tidal wetland, its boundary being mean high water. It is a prime area for wintering waterfowl. No waterfowl hunting is permitted at the refuge. Enforcement issues center around the construction of illegal structures, mainly docks and seawalls, along the shoreline. Illegal moorings on the refuge are also increasing.

Sandplain gerardia
Don Sias/TNC

Much staff time is spent researching the historical status of all structures on refuge property and reviewing permit applications for construction, repair, or replacement. Public use on the refuge includes boating, associated water sports and fishing, as well as environmental education and interpretation through The Waterfront Center and Friends of the Bay. Shell fishing does occur on the refuge, but is controlled by the Town of Oyster Bay as a result of the Deed of Gift.

Sayville

The FAA property adjacent to Sayville contains the largest population in the state of New York of sandplain gerardia, a federally listed endangered plant. The refuge is closed to the public except by special use permit. Most violations involve trespassing, particularly by local juveniles and the homeless.

Seatuck

Seatuck is closed to the public, except by special use permit. We do have an Ecological Services office and two residences inhabited by Service employees on this refuge. Most violations involve trespassing, dumping, and vandalism.

Target Rock

This refuge, located 45 miles west of Complex Headquarters, is open to the public year-round, and is part of the Federal Fee Demonstration Program. Law enforcement at this station includes intermittent fee compliance checks and regular patrols. Approximately half of the beachfront is closed from April 1 to August 31 to protect nesting bank swallows and shorebirds. Entry into closed areas, unleashed dogs, jogging, and violations of state fishing regulations occur occasionally. Vandalism and trespassing during closed hours are also occasional problems.

Wertheim

The Complex headquarters houses its main administrative and maintenance facilities. The brunt of the Complex law enforcement is conducted at this station. Illegal entry to refuge buildings has occurred in the past, resulting in the theft of thousands of dollars of government property. The installation of an alarm system, security lighting and fencing has alleviated most of the problems. Trespassing into closed areas and after refuge hours occurs frequently.

The Suffolk County Police Department has investigated three violent crimes on or close to the refuge in the past 17 years, and has interdicted prostitution at the fishing access site off Montauk Highway.

Evidence of white-tailed deer poaching is prominent, with one recent case resulting in an arrest and prosecution. The dumping of household trash and construction debris is a persistent problem, as is using ATVs illegally. Although on the decline, wildland arson has also been an ongoing problem. The vandalism of refuge signs and gates occurs sporadically.

Visitor Center/Headquarters

Wertheim serves as the headquarters for the Complex because of its central location among the refuges and its easy accessibility from major public roads. It is located in the Town of Brookhaven, Suffolk County, New York, approximately 45 miles from New York City.

The existing administrative office space for the Complex is a 1,200 sq.ft. converted hunting lodge built in the early 1900s. Two refuge staff first used it as office space in 1974. Since then, the Complex has grown to encompass 9 refuges, 12 permanent employees, and varying numbers of seasonal employees, student interns, volunteers and partners. The headquarters facility now consists of the original converted hunting lodge, two office trailers, and a small office in the maintenance shop. As our scope of operations and responsibility has increased, the present office space has become severely inadequate and unsafe to serve the public or the missions of the refuge, the Complex and the System.

In 1991, refuge staff developed a station management plan for the Complex approved by the Regional Office in 1992. Since that time, the location and timeline for building the facility changed due to funding. One of that plan's management focus areas was the development of a visitor center at Wertheim. The refuge public use management plan also called for a visitor center. The proposal for a visitor center is an outgrowth of earlier efforts to provide the public with wildlife-dependent recreational and educational opportunities throughout the year. The visitor center would also resolve the current, inadequate office space problems.

These are our goals for a Headquarters and Visitor Center at Wertheim.

1. Help meet the needs for wildlife-dependent recreation, environmental education and interpretive exhibits, programs, opportunities for residents and visitors to Long Island year-round in any weather.
2. Provide a safe and effective working environment for the staff, volunteers, seasonal interns and visitors at the Complex, and provide the public with direct access to Complex staff.
3. Provide ecotourism and economic benefits to the surrounding communities and Long Island.
4. Provide a high-quality, wildlife- and habitat-oriented Visitor Center for Long Island.
5. Illustrate the mission, activities, and achievements of the Fish and Wildlife Service, the National Wildlife Refuge System, and the Long Island National Wildlife Refuge Complex for the American public.

Note. Only alternative B proposes a visitor center/headquarters. Alternatives A and C propose the temporary relocation of staff with the existing office site serving as a visitor contact station and also supporting some office and maintenance staff.

Partnerships

Our staff is heavily invested in habitat restoration programs off-refuge that export the Service expertise to benefit wildlife across Long Island. Such activities include re-establishing native warm season grassland, improving beach habitat for colonial water birds, setting back the succession of red cedar from a unique maritime grassland, and improving salt marsh habitats. The Complex led the formation of the Long Island Wetland Restoration Initiative, which has partnered with more than 20 land-owning entities in restoring more than 2,000 acres of Long Island wetlands since 1997. In late 2000, the Complex entered into an Interagency Agreement with the U.S. Department of Energy to manage wildlands at nearby Brookhaven National Laboratory. That partnership furthers the Service mission by funding pine-barrens-related ecological studies and applying habitat management techniques that may also be applied to Complex refuges. Our staff also contributes technical expertise to the Long Island Pine Barrens Commission, a government—private venture aimed at protecting unique natural communities. See table 3.7 for a list of some of our partners.

We work diligently to reach out to those who will take wildlife and natural resource conservation into the future: the children and young adults attending schools on Long Island. Our staff

Table 3.7. Established Partners

BOCES (Nassau; E. Suffolk)	National Park Service
Central Pine Barrens Commission	- Fire Island National Seashore
Cornell Cooperative Extension	- Sagamore Hill Historic Site
Dowling College	The Nature Conservancy
Ducks Unlimited	NY Fishing Tackle Trade Association
Elected Officials	NYSDEC
Environmental Defense	NYSDEC Forest Rangers
Foundation for Ecological Research	Post Morrow Foundation
Friends of the Bay	Southampton College
Friends of Wertheim	Southampton Trail Preservation Soc
Greenbelt Trail Conference	SUNY Stony Brook
Long Beach School District	Suffolk County Parks
LI Institute of Professional Studies	Suffolk County YCC
Long Island Power Authority	Towns
Long Island Weed Management Area	Trout Unlimited
Master Naturalist Society of LI	Trust for Public Lands
Media	U.S. Department of Energy
Nassau County Parks	- Brookhaven National Laboratory
National Audubon Society	Volunteer Fire Departments
	Waterfront Center at Oyster Bay

*Not a comprehensive list

collaborates with the Long Island Institute of Professional Studies, providing workshops and presentations for teachers learning to bring environmental education into their classrooms. The Complex has given first-hand experience to local high school students who, in turn, conduct scientific research and monitoring on refuge lands. Many of our major outreach efforts involve staff participation and as many as 20 environmentally oriented entities.

Since Friends of Wertheim incorporated in fall 1998, they have contributed their energies, advocacy, and innovative ideas for conservation, such as acquiring wildlands slated for development. The Friends are a non-profit advocacy group dedicated to supporting Complex goals in the community through public education and interpretation, project funding, and volunteer coordination. They are "dedicated to the enduring protection, management and appreciation of Wertheim refuge and its environs."

Volunteers

The Complex-wide volunteer program is managed from the Wertheim headquarters. Approximately 100 volunteers are used regularly to assist in various duties: survey work, nesting structure upkeep and monitoring, facilities and trail maintenance, photography, and administrative assistance. Partnerships with the Suffolk County Department of Labor Youth Conservation Corps, programs like Americorps, and the Service SCEP and STEP programs offer resources for placing volunteers at the Complex. There is great interest and potential in expanding the volunteer program at the Complex.

Facilities and Maintenance

The facilities and maintenance center for the Complex is also at Wertheim. Complex staff offices are spread out across four buildings to meet minimum space requirements for each staff member. The main office, situated on the western shore of the Carmans River, was historically a seasonal hunting camp for the Wertheim family. That building is small, and contains only two private offices, a lunch room/conference room and a reception area. To accommodate our staff, we purchased and converted two trailers into office space, without plumbing facilities, directly across from the main office in the late 1990s. The trailers provide office space for five employees as well as two Ducks Unlimited personnel. Our maintenance staff shares an office inside the maintenance shop building.

Facilities are present at Wertheim's main office area, the Wellington property, and Seatuck, Target Rock, and Morton refuges. All four refuges were historically staffed, and therefore, contain offices, quarters and an array of outbuildings. Since the Complex was reorganized in the mid-1990s, only the Wertheim offices have been staffed. Unstaffed offices at Target Rock and Morton are used as visitor contact stations.

The Complex maintenance facility is located next to the office complex at Wertheim, and consists of three separate buildings: maintenance, wood shop, and storage. The maintenance building contains an office and three garage bays with a vehicle lift that allows most mechanical repairs. The wood shop building contains the woodworking shop with several carpentry tools. Most of the small engine equipment is contained within that building's three bays. A small section of the wood shop building designated as the fire cache contains nearly all of the fire equipment for the Complex. Everything from interpretive brochures to old electronic equipment can be found in the walk-in attic upstairs in the wood shop. The wood shop is in poor shape and, as a result, some materials stored in it are getting damaged.

The Complex requires a rather extensive refuge quarters program. Quarters are a necessity given the extreme high cost of living on Long Island. Without the housing, employees could not afford to work at the Complex. Having FWS employees on the refuges 24 hours a day also provides security. The quarters are located at Wertheim, Seatuck, Target Rock and Morton. Refuge employees rent the houses located at Wertheim and Morton, while the Division of Law Enforcement employees rent the quarters at Seatuck and Target Rock.

The maintenance staff consists of three employees: an engineering equipment operator/maintenance leader, a carpenter, and a maintenance worker. Those employees are responsible for Complex-wide maintenance, and lend support to the biological, public use, and resource protection and visitor safety programs. Regular maintenance is required at the Wertheim, Morton and Target Rock refuges, which contain public restroom facilities and nature trails. The frequency of maintenance is contingent upon the seasons and the weather.

Environmental Contaminants/Oil Spills

In 1990 and 1991, Service contaminant specialists investigated Wertheim, Oyster Bay, and Amagansett for the presence of environmental contaminants. They sampled sediment, surface water, and animal tissues. The sediments collected at Wertheim and Oyster Bay contained several heavy metals, including lead, zinc, cadmium, chromium, copper, manganese, mercury, and arsenic, at levels exceeding at least one of the concern levels reviewed. The studies concluded that there is a transport of contaminants onto Wertheim and Oyster Bay. At Wertheim, the lower reaches of Little Neck Run and Yaphank Creek and the Carmans River south from Montauk Highway to the Complex headquarters were identified as depositional areas with the greatest level of contamination.

The Complex biologist traditionally served as a field response coordinator for coastal oil spills in New York Harbor, the tidal portion of the Hudson River, and Long Island's shoreline. That duty is now shared with staff from our Ecological Services New York Field Office. In 2000, the Complex received 150 reports of oil or gasoline spills. Most were minor, and minimally affected our federal trust resources.

Research and special use permits

Special use permits must be applied for in writing to the refuge manager. Each request is thoroughly reviewed. Most requests for academic research on the refuge are approved but each has special conditions assigned to it to ensure safe and compatible work. All research or studies require a final report of findings upon completion of the project. Institutions such as the State University of New York, Harvard University, and the U.S. Geological Survey Biological Resources Division have performed diverse, impressive research at the Complex. Since 1999, studies have been undertaken on the effects of Open Marsh Water Management, juvenile American eel migration, salt marsh subsidence, maritime grassland community associations, non-target effects of mosquito control, and marsh mallow genetics.

A staff member educates a student group about beaver ecology.
Matt Poole/USFWS

Environmental educators may also request special use permits to use limited access areas within the Complex. We require them to submit a proposal which outlines their program objectives, activities conducted, and the areas to which they seek access. There is no charge assigned to educationally-based special use permits. Occasionally, we issue permits to nature photographers to enter closed areas. In turn, they traditionally have allowed us to use their images in our outreach materials, but that is not a requirement. There are also special use permits for commercial benefit, but only if it is compatible with the resource; in those instances a charge is assigned.